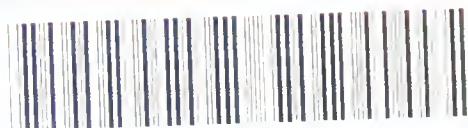


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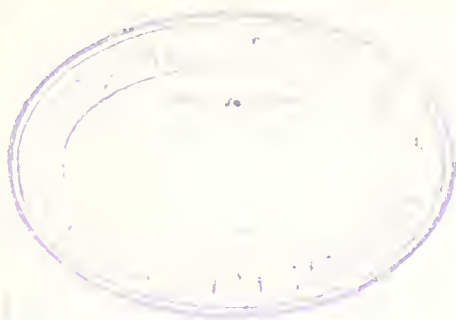
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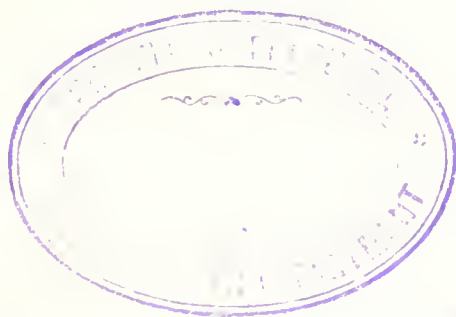


THE
LONDON WATER SUPPLY

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PREFACE

THE whole question of the Metropolitan water supply—its sources, ownership and control—will be once more before Parliament in the present Session. It does not seem probable that the Royal Commission, appointed to inquire into the expediency of purchase, and still engaged in taking evidence, will be able to report on that very important aspect of the question for some considerable time to come ; but the London County Council have resolved to proceed at once with Bills for the purchase of the water companies' undertakings and for obtaining fresh supplies from Wales, without waiting for the report of Lord Llandaff's Commission. On the other hand, several Bills have been deposited by the water companies for remedying the state of things revealed last autumn, and particularly for improving the position of the East London district. Other private Bills have also been prepared. Lastly, it is possible that the Local

Government Board, if dissatisfied with the companies' proposals, may introduce a Bill of its own, dealing with the same question.

Whatever may be the upshot of all this preparation, a great deal of controversy and discussion is inevitable. The preliminary skirmishing which has been going on all the winter is only the prelude to a big Parliamentary engagement. The most strenuous opposition from various quarters will be offered to the proposals of the County Council, who, in turn, may be trusted to follow the usual policy of resisting to the uttermost all measures brought forward by those who are still actually responsible for providing London with water.

The general public stands looking on with but a confused idea of the merits of the question and a somewhat languid interest in it ; which is a pity, for the consumers are at once the prize for which the combatants are fighting and the judges of the fray. They have a double interest in the issue. But busy men have no time to follow the ins and outs of an intricate controversy, that has its roots in the distant past ; and they are apt to weary of it, when presented in a piece-meal fashion, through the want of knowing 'what it is all about.' This book is intended for their information. It is an attempt

to give the general reader a broad and comprehensive grasp of the London water question, which can only be properly understood in the light of its history; so as to enable him to judge the true bearing of the present situation and the various points at issue. If the views expressed tend to one side of the controversy, that is solely because an impartial study of the facts for some years past has led me in that direction. It is, indeed, a strong conviction that the public judgment has long been misled and the whole subject obscured by current misconceptions which has moved me to write the following chapters. If my facts are inaccurate—though I have not spared any pains to make sure of them—they are open to correction; if my views do not commend themselves to the reader, he can reject them. I merely offer those who are interested an opportunity of forming their own conclusions from a more comprehensive review of the subject than has hitherto been available.

February 1899.

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CHAPTER I

INTRODUCTORY.—PUBLIC OPINION AND THE WATER COMPANIES

IF ever the gentle precept ‘Hit him again, he has no friends,’ was vigorously carried into practice, it is in relation to the existing system of water supply in London. For years the water companies have been a common cockshy for every kind of ridicule and abuse. It is true they do not stand altogether alone in this respect. A good many people seem never to emerge from the schoolboy stage of existence, in which throwing stones is a constitutional necessity: they must have something or somebody to abuse, and several objects are consecrated to their needs by a time-honoured usage. There are the railway companies, for instance, the vestries, and the Post Office—especially the Post Office. But the license permitted in castigating these public enemies is as nothing

compared with the orgy of vituperation directed against the water companies. Where they are concerned, not only truth and justice, but ordinary fair play, good manners, and the amenities of civilized life are thrown to the winds. It is considered lawful and proper to say anything against them and everybody connected with them. Corporations and companies, having, as we know, neither a body to be kicked nor a soul to be damned, are regarded as fair game, but only in their corporate capacity. We may condemn the telegraphic service of the Post Office, but we do not accuse the distinguished electrician who presides over it of dishonourable conduct; we may denounce the Brighton Railway Company, but we do not make a personal attack upon the superintendent or the engineer; we may hurl ridicule at the vestries, but we do not call the surveyors liars and rogues. In short, a certain decency is observed in these matters, and the line is drawn at the individual. Any one who oversteps it is coldly regarded as a very ill-bred fellow.

With the water companies alone it is different. Their corporate misdeeds—or alleged misdeeds—are freely visited upon individual officials. To bait a secretary or an engineer is considered fair and legitimate sport. These gentlemen are not politicians or public servants; they do not appeal to the public, they are not paid by the public, and they are not answerable to the public. They are private

citizens and professional men, entitled to the consideration accorded not merely to every gentleman, but to every member of the community. And yet, just because they happen to be connected with these companies, any one with a mind to considers himself free to load them with personal insults. It is hardly necessary to quote examples. Last autumn the newspapers—chiefly, but not wholly, of a certain political complexion—teemed with insults, spiteful innuendoes, and silly sarcasms against the officials of the East London Company, as if they were personally responsible for the existence of the concern, which was established by Parliament before they were born, or for its conduct, which is controlled by a board of directors and strictly conditioned by the law. In a printed broad-sheet, drawn up and distributed by a ‘League,’ one of them was accused of ‘unscrupulous mendacity,’ and a newspaper correspondent, calling one day at the works, shouted at a subordinate official, who had treated him with perfect courtesy, ‘You are a disgrace to civilization,’ and that upon his own premises. These and other gentlemen connected with water companies have been repeatedly charged with bad faith, professional incapacity, the most sordid motives, and the deliberate infliction of suffering and death. Even the eminent men of science who analyse the companies’ water are constantly subjected to the insinuation that they falsify their analyses.

All this personal mud-throwing indicates the existence of an extraordinary *animus*. That language which would be in bad taste in the case of a convicted felon should be freely applied by presumably sane and respectable persons to gentlemen of high character, of whom they know nothing whatever, simply because of their connection with the water companies—such license can only be explained by a consciousness on the part of those who exercise it that public opinion will sanction, if not applaud, any excesses in attacking those institutions, so great is the odium in which they are held. ‘Hit him again, he has no friends,’ is their cry, and they are nearly right, but not quite. They have forgotten that public opinion will in the end insist on fair play, even for the water companies, however odious they may be; and the attempt of their enemies to deny it them will raise them up friends.

Meanwhile, there is no doubt about the odium, and no difficulty in understanding how it has arisen. We none of us love those to whom we have to pay rates. We know that it has to be done, but the demand notes have a way of coming at inconvenient times, and the sight of them is irritating. Then a grievance possesses great attraction for many of us. For some mysterious reason we like to be told that we are badly treated, and we lend a ready ear to such suggestions. Many people, again, delight in mere abuse for its own sake. For all these reasons attacks

on the water supply have always fallen upon fruitful ground. If it had been perfection, we should have grumbled about it. But, being a human institution, it is no more perfect than any other, and from time to time it has given real grounds for hostile criticism. That, however, is no more than can be said of pretty nearly everything in this world, and it does not account for the extraordinary disfavour in which the water companies now stand. They have moved with the times, as I shall show later on, quite as fast as other institutions; defects have been remedied, and improvements introduced according to the advancing needs and knowledge of the day; the history of the London water supply is one of continual progress. And yet those who provide it stand in far worse odour to-day than at any previous period. The reason is not far to seek.

Dissatisfaction with the water supply on one ground or another has arisen from time to time since an early period in the century, and in 1883 considerable impetus was given to it by the remarkable case of *Dobbs v. the Grand Junction Company*; but the extreme prejudice against the water companies dates from the creation of the London County Council, when the water supply became a political question. With the proceedings of the County Council I shall deal later on; at present I am only concerned in tracing the growth of public opinion. Ever since the County Council came into existence

—and even before it held a single full meeting—it has aspired to be the water authority for London. A very legitimate aspiration, no doubt, and creditable to the enterprise of the newly constituted body. But in order to carry out such a very large change a strong backing of public opinion was found to be necessary, and this became more apparent as time went on and the general goodwill with which the Council started began to give place to distrust in many quarters. The less the Council was loved, the more must the companies be hated if Parliament was to be persuaded to exchange the one for the other. Accordingly it became the business of those who ardently desired a public water authority to see that the companies were hated. Doubtless the end seemed to them sufficiently good to justify the means. That is the way with very ardent reformers: in their eyes a good cause—that is to say, anything they happen to take up—justifies any means. In perfect good faith—from this point of view—they set to work to fan the inherent discontent of consumers into a blaze. For years past we have had it drummed into us that London is abominably served with water; that it is scanty in quantity, bad in quality, and excessively dear; that we drink ‘diluted sewage’ to the extreme danger of our health; that most, if not all, other towns have an ‘incomparably better’ and much cheaper supply; that the water companies are ‘bloated monopolies,’ and think of

nothing but 'swelling their dividends,' which are enormous; that by some underhand pressure they have obtained from Parliament special Acts which, on the one hand, protect them from penalties when they fail to do their duty, as they constantly do, and, on the other, give them the most tyrannous rights over the consumers; that municipal water authorities possess no such protection and no such powers. As a corollary, we are given to understand that if only we get rid of the companies and instal a municipal authority, we shall be supplied for next to nothing with any quantity of water of the most admirable quality, provided from some 'pure and inexhaustible' source; that we shall never be troubled about fittings or waste; that the water will never be cut off for non-payment of rates, if indeed we pay any rates at all; and that frozen pipes, being all the fault of the companies and unknown under municipal rule, will be a misery of the past.

This, I submit, is no exaggerated statement of the wrongs of Londoners and the way to right them, as popularly expounded in recent years. How much truth there is in it all will be made clear in the succeeding chapters, which will deal with the actual facts. For the present it is enough that these things are said and widely accepted. No doubt sensible men of affairs do not take everything quite literally, and the virtues of municipal rule have hitherto failed to inspire much general enthusiasm; but

everybody—except those who have made an impartial study of the facts—believes more or less in the iniquity of the water companies. Even well-informed and moderate minded men are fully persuaded that at any rate the London water supply is very inferior to that of most other towns; that the companies possess special privileges which enable them to act in a ‘high-handed’ manner; that cutting off ‘one of the necessities of life’ and charging full rates for an intermittent supply are gross abuses peculiar to the present régime, and that consumers are badly treated in general, without any chance of redress.

This, or something like this, is, I say, universally believed, and no wonder. It would be very surprising if it were not. When people see a thing publicly stated, not once or twice, but over and over and over again, without contradiction, they are bound to believe it. The case goes against the defendant by default. It is true that many public inquiries have been held, from which the water companies have always emerged with credit, and that no serious charge has been successfully sustained against their supply before a responsible tribunal, at any rate for the last seventy years. But few people read blue books or official reports, and the effect of such evidence on public opinion is soon erased by time. The old cries reappear, and by dint of constant repetition gradually establish themselves so firmly

that all testimony to the contrary is impatiently regarded as absurd or false. Hence it is possible for public speakers and writers to maintain, for instance, that the London water is of bad quality, and that the health of the community has suffered, in the face of the most absolute proof to the contrary. It has been nobody's business to bring the rebutting evidence forward and to hammer away at the facts with the persistency and energy displayed by the attacking party. Had this been done the mountain of prejudice and misconception that has gradually arisen could never have been reared; for the public is quite capable of seeing what is true and what is not when both sides are put fairly before it. The water companies have pursued the mistaken policy of relying on the tribunal of Parliament and of Government inquiries, and have ignored the constant shower of small missiles. But it is the perpetual hammering away at a subject which forms public opinion. The result is that all the world honestly believes London to be in a very bad way indeed and groaning under a villainous system. The inhabitants of other towns, who are not half so well off in reality, presume to pity the metropolitan consumer. For instance, we find a Birmingham gentleman, and the author of a book on the water supply of that town, kindly commiserating Londoners on their unhappy state, although they pay considerably less for a much larger and at least

equally good supply, and are liable to far less severe treatment at the hands of the iniquitous companies than the corporation of Birmingham is empowered to inflict upon its own highly favoured consumers. When a municipal supply breaks down through frost or drought, the ratepayers not only go on short commons without any reduction of rates—which is such an iniquity in London—but they have the additional pleasure of paying for the breakdown. This constantly happens in the large provincial towns; but in spite of it they pity London, so strong and wide-spread is the prejudice created against the existing system.

Now I am perfectly aware that convinced advocates of a municipal water supply do not care two straws about the facts. In their eyes it is absolutely wrong for the water to be in private hands, and whether the supply is well or ill managed makes no difference. But the mass of consumers, on the other hand, do not care two straws about municipalization, or any other theoretical consideration for its own sake. Their views are practical. They want a good water supply on the easiest possible terms, and they are quite right. If a municipal authority will give it them, then by all means have a municipal authority; but if it will not, there is no sense in having it for the mere sake of the name. I do not pretend to decide the question. Personally I have no objection to a municipal authority and no

a priori preference for one. It exists in most large towns, and appears to give satisfaction, which is a certain argument in its favour; but the circumstances of London are altogether exceptional, and must be judged by themselves. And the first essential for forming a right judgment is knowledge of the facts. It is not to the public advantage that prejudice should take its place, and should decide an issue of this importance. The public are therefore warned that the extreme odium with which they have been taught to regard the existing water supply has been artificially fostered for political ends, and is not justified by the facts. It has been got up for two purposes: (1) to get rid of the existing system, (2) to cheapen the purchase price by depreciating the value of the undertakings. In themselves these are perfectly legitimate objects. The best method of managing the water supply is a matter of opinion, and any one who thinks it ought to be in public hands has a right to work for that end. Again it is commercially permissible, I believe, to depreciate the value of an intended purchase. What is not legitimate is to promote these ends by misrepresentation and by throwing dust in the eyes of the public. That this has been done on an extensive scale, and with extraordinary success, will be made clear, as I believe, in the course of the account of the water supply which follows.

CHAPTER II

THE ORIGIN OF THE WATER COMPANIES¹

A FRIEND of mine, discussing the water question not long ago, observed, in answer to some remark, 'But surely water is a free gift of Nature.' This phrase embodies a common confusion of mind, which is, I believe, at the bottom of much of the resentment cherished against water companies. The notion is that water being a free gift of Nature, and one of the necessities of life, no one has a right to treat it as private property, to be given or withheld, to be traded in at a profit. Thus a 'Consumers' League' last autumn included among other counts against the East London Company that it got the water 'out of *our* rivers,' with the inference that 'we,' being the original owners, had a right to waste it as much as we pleased. The same notion seems to haunt the minds of metropolitan magistrates, when they sympathise with consumers whose water has been cut off for non-payment of rates. Every one, it is felt, has a moral right to water, which is a gift of Nature and

¹ For a good deal of the information contained in this chapter I am indebted to Bolton's 'London Water Supply,' edited by P. A. Scratchley.

a necessary of life, and there is something wrong in a system which permits any poor wretch to be deprived of it for such a sordid reason as non-payment of a trifling sum to a wealthy creditor.

Well, water is a gift of Nature, and every one *has* a moral right to it in the river. Or it may be in the earth or in the clouds. But water laid on in the house is *not* a gift of Nature. Nor does the water company by cutting it off deprive any one of one of the necessities of life; it only deprives him of the convenience of drawing it from a tap. He can still do what he would have had to do had there been no water company, and what is done to this day in every village in England. He can take his bucket to the river or to some well, or he can pay some one else to do it for him. In any case it will cost him labour and time, or the equivalent in money. In truth, good water laid on in the house is no more a gift of Nature than loaves of bread brought to the door. And bread is equally one of the necessities of life. Yet no one thinks it iniquitous of the baker to cut off the supply when his bill remains unpaid. The confusion of thought is characteristic of the modern town-dweller, who has been so long surrounded by artificial conveniences, by taps to turn and buttons to press, that he regards them as natural, forgets their origin, and to whom he owes them. It is necessary to remind him.

Fresh water only occurs naturally in the form

of springs, running streams, lakes, and falling rain. To get it into the house in any case means a certain expenditure. If it be obtained out of the ground by sinking wells, still greater expense has to be incurred; and then the water is either pumped or drawn in buckets, which involves more labour or money. In every village water is to this day fetched in buckets from the stream, the dipping-well, or the pump. So it was in London and elsewhere before the wicked companies arose. The town or parish authorities put up pumps connected with shallow wells, and in some cases they brought spring water from one place to another by conduits, of which the names survive in certain streets; but the house to house distribution in pipes was beyond them. They would not and did not stir a finger to provide this sort of water supply; nor is there any reason to suppose they ever would have done so, if the thing had not been taken in hand and turned into an established success by private enterprise. Consider for a moment what this means. A great stir was made last autumn because the water was only turned on in the houses for four hours a day in East London. Between whiles people could fetch it from standpipes down the street, which is what the villager does from one year's end to the other, except that no pumping is required at a stand-pipe. And yet, though the Londoner's state was better than the villager's by four hours' tap service and no

pumping to do, he was supposed to be enduring the most intolerable hardships, while London was threatened with a terrible pestilence. All this because the Londoner was temporarily deprived of a purely modern convenience, and reduced to something remotely approaching the natural conditions in which he lived before the water companies came to his rescue, and to which he returns when he betakes himself to the country. But, it may be said, in that condition he pays nothing for the water, whereas he is charged rates in the town, and, therefore, has a right to demand the convenience. He has a right within the terms of the contract, of which I shall say more later; but does he pay nothing in the natural condition? Water in the river or the well is of no use; it is wanted in the house, and it has to be fetched. What would be the cost of supplying the smallest house in East London in this fashion? It could not be put at less than 4*d.* a day, or say half-a-crown a week, which comes to 6*l.* 10*s.* a year. The water rate paid for such a house is about 10*s.* 6*d.*

These preliminary observations will suffice to show the fallacy of the 'gift of Nature' theory and the arguments founded upon it. Those who lived when private enterprise began to trade in the gift of Nature were under no such illusions. They regarded the water companies as public benefactors, which indeed they were. The pioneer was a Dutch

engineer named Peter Morrys, who in the year 1582 obtained permission from the Corporation to pump water from the Thames into the City by means of water-wheels placed in the first arch of London Bridge, and driven by the tide. 'Before this time no such thing was known in England as this raising of water. It was done by a mill, and was the first waterwork that was made use of to supply the Citie of London with Thames water; and this water-mill furnished the neighbouring parts of the Citie as far as Gracechurch street.' (Stow.) The Lord Mayor rode down in state to see the water thrown over St. Magnus's steeple by Morrys's wheels. This system, inaugurated under a 500 years' lease from the Corporation, and extended as time went on until five arches of the bridge were occupied with water-wheels, supplied the City for 240 years and the Borough for fifty. It only came to an end with the demolition of the old bridge in 1822. Before that time the works had changed hands more than once. In 1701 the Morrys family sold their rights for 38,000*l.*, and a company was formed to develop the undertaking. In 1822 the New River Company, which had been gradually squeezing out the old Thames supply, purchased the whole concern, but subsequently transferred the works on the Surrey side of the river to a private owner, whose interest was eventually developed into the Southwark Company. The

original lease granted by the Corporation in 1582 has still nearly 200 years to run, and until its expiry the New River Company has to pay 3,750*l.* a year to the representatives of the former owners.

The New River Company itself, which comes next in chronological order, is a still more striking example of the benefits conferred on London by private enterprise in the matter of water supply, because the Corporation had the opportunity of undertaking the work, but declined to do so on account of the pecuniary risk. According to the official account preserved among the State papers of Charles I., the ‘Maior, Comonalitie and Citizens,’ had, by virtue of two Acts of Parliament, ‘free libertie given unto them and were enabled to bring a ffresh streame of runing water to the North parts of the Citty of London from the springs of Chadwell and Amwell and other springs in the Countie of Hertford.’ Let the Collectivist, who loathes private enterprise and attributes every evil under the sun to it, mark what happened. At that time—the beginning of the seventeenth century—the Londoner had nothing but the tidal Thames, a few small polluted brooks and shallow wells, for his water sources; and then it had to be fetched in buckets, except in so far as Peter Morrys’s wheels supplied a portion of the City. The Corporation, at the instance of Sir Hugh Myddelton, obtained powers to bring the lovely water of the Hertfordshire

springs and distribute it in pipes. A greater boon could not be conceived, but 'the said Maior, Comonalitie, and Citizens, considering the great charge and expense of the saide worke and doubtinge much losse might befall upon the Chamber of the said Cittie, in case the said worke should not succcede well and prove beneficall, did thereupon forbear at their common charge to undertake the saide worke soe as the same lay long neglected and unlike by them to be p'formed.' Whereupon private enterprise came to the rescue, as it has done in a thousand other cases, and did for the public what the municipality refused to do. Sir Hugh Myddelton undertook the work himself, but after making considerable progress he found that it would cost more than he could afford, and he had to seek assistance from others. He formed a syndicate of 'divers persons of qualitie who were willing to adventure and joyne with him in contribucion towarde the charge of the saide worke.' That was the origin of the London water companies.

The New River water was brought to London in 1613, and was received with a great flourish of trumpets as a public benefaction. It was distributed in pipes over a wide area and laid on in the houses, the use of the service pipe and taps being granted on lease for an annual payment. The company was duly incorporated by letters patent in 1619 with various rights and privileges. Half the profits

were to go to King James, who had borne half the expense of construction ; but as losses ensued instead of profits, in the year 1631 Charles I. disposed of his share to Sir Hugh Myddelton for the consideration of 500*l.* a year, to be paid in perpetuity to the Crown under the name of ‘ King’s Clogg.’ The Crown still retains this interest in the New River Company and receives the 500*l.* a year. The remaining half of the waterworks consisted of thirty-six shares, of which Sir Hugh Myddelton held thirteen. When the present fabulous value of these shares—I believe they are worth about 120,000*l.* apiece—is dangled before a gaping public it is as well to remember the circumstances of their origin and the early struggles of this truly philanthropic enterprise.

It would be tedious to follow the early development of all the water companies in detail, but some reference to their several origins is necessary to give the reader a fair grasp of the subject. They all arose from small beginnings in response to the public demand for water laid on in different parts of the town, as building extended. No public authority appears to have ever raised a finger to supply the needs of the people, and those who invested money in making good the deficiency did so at considerable risk. Many of the companies paid no dividend for years, and none of them made much profit at first.

The East London supply had its origin in the Shadwell waterworks, established in 1681. They were supplemented in 1747 by the West Ham works, which pumped water from the river Lea for the supply of Stratford, West Ham, and Bow. Both these undertakings were bought by the London Dock Company in the present century and then sold to the present East London Waterworks Company, which was established by Act of Parliament in 1807 with a capital of 190,000*l*. The water was supplied from the tidal portion of the Lea with settling reservoirs at Old Ford. The gross revenue in the first year was 10,051*l*. 11*s*. The dividend only averaged $2\frac{1}{4}$ per cent. for a long time, and in some years none at all was paid. The average rate was 1*l*. 2*s*. 11 $\frac{1}{2}$ *d*. per house, and the daily supply 54 gallons. In 1829 the intake was moved up to Lea Bridge.

The Chelsea Company started in 1723 under a royal charter with a capital of 40,000*l*. The water was taken from the Thames at Chelsea and distributed at first without any purification. However, as time went on, and the river grew fouler, it became necessary to do something, and settling reservoirs were tried. On their proving insufficient sand filter-beds were designed and constructed in 1829. These were the earliest attempts at filtration, and they were undertaken voluntarily by the Chelsea Company. In 1852 they removed their intake to Surbiton and entirely reconstructed their works.

The Grand Junction supply dates from 1798, when the Grand Junction Canal Company was empowered by Act of Parliament to lay pipes and supply water from the canal to the inhabitants of Paddington. In 1811 these powers were transferred by Parliament to the Grand Junction Waterworks Company. The source of supply continued to be the canal until 1826, when it was changed to the Thames at Chelsea. As with the Chelsea Company, the increasing foulness of the river necessitated a change, and the intake was removed up to Kew, where large works were constructed and connected with the reservoirs at Paddington by a 30 in. cast iron main. This achievement was the first of its kind, and is comparable with the introduction of sand filtration by the Chelsea Company.

The remaining company on the north side of the river is the West Middlesex, which was established by Act of Parliament in 1806 for the supply of a rather irregular district, including West Kensington, Hammersmith, Fulham, Westminster, part of Chelsea, Battersea, Putney, Barnes and Richmond. It started with a capital of 30,000*l.*; but the very costly works undertaken soon necessitated large and repeated additions. In consequence no dividend at all was paid for thirteen years, and only a very small one for many years afterwards. The water was taken from the Thames at Hammersmith, where two subsiding reservoirs were built.

Large service reservoirs were also constructed at Campden Hill in 1809, and at Barrow Hill in 1825. More large subsiding reservoirs were made at Barnes in 1838, and various other extensive works carried out from time to time. It is rather curious that the West Middlesex Company, which went through such a long period of adversity in the early part of its career, should have been the first to reach the maximum dividend allowed by the law. Its customers have for some time been enjoying a large reduction in rates from the surplus income.

Of the three companies on the Surrey side of the river, the oldest is the Lambeth, which was established in 1785. It began in a very small way with an engine of 20-horse power. The works were opposite Charing Cross, and water was pumped from the river direct to consumers. It is interesting to note that one of the chief objects of the proprietors was to provide protection against fire, but they received no assistance from the insurance offices. The first list of consumers desiring to be supplied from the company's pipes only included 629 houses, but the convenience soon began to be appreciated, and urgent requests for an extension of pipes soon became frequent. For instance, a letter was received 'from sundry inhabitants residing near Belvedere Place, setting forth that unless speedily supplied with water they *must* be induced to quit their habitation, as no lodgers will stay with them on that account ;' and

in 1791 the requests were reported to be so numerous that it was impossible to procure pipes fast enough to 'satisfy the pressing application for "driving."' The difficulties encountered were so great that all the income was absorbed in extending the works, and for nearly twenty years no dividend was paid. Moreover certain simple-minded persons, acting on the free-gift-of-Nature theory, were in the habit of helping themselves clandestinely from the company's taps and even supplying their neighbours. In the early part of the present century large additions to the works were made from time to time, and in 1833 settling reservoirs were built at Brixton. Extensive districts, however, which were constantly increased by building operations, still remained without water laid on, and the inhabitants used to buy it from water-carts, being charged from three farthings to twopence a pail, according to the degree of pollution. In order to meet the urgent needs of these districts, and to get a cleaner water than the tidal Thames, which had become very objectionable, the Lambeth Company in 1847 decided on the very enterprising step of moving their intake and works up to Long Ditton. They thus voluntarily led the way to one of the most important improvements ever effected in the metropolitan water supply.

The Southwark and Vauxhall Company, which adjoins the Lambeth, had its origin in the old water-wheel works under London Bridge, which were

bought from the New River Company in 1822 and joined to another private concern in the district, dating from 1771. After some changes, the Southwark Water Company was formed in 1839, and proceeded to the construction of works at Battersea. In 1845 it amalgamated with the Vauxhall Company, which had been originally formed in 1807 under the name of the South London Company. This concern had reservoirs at Kennington, and supplied that part of the town with water taken from the Thames at Vauxhall creek. After amalgamation the whole of the works were located at Battersea, but in 1851 the company applied to Parliament to move their intake to Hampton.

The eighth and last company is the Kent. It was incorporated by Act of Parliament in 1809, and empowered to supply Greenwich, Deptford, Lewisham and the neighbourhood. This company is distinguished from the rest by the fact that the whole of its supply is now obtained from deep wells in the chalk; but originally it was not so. There had been works on the River Ravensbourne since 1701 for the supply of the royal manors of Sayes Court and East Greenwich, and these with all rights and privileges came into the possession of the Kent Company on its formation for the sum of 65,000*l*. The water rental at that time only amounted to about 2,000*l*. a year; but the area of supply was rapidly extended to meet the public wants. Among

other districts was Woolwich, which voluntarily abandoned the chance of having its own municipal supply, and begged the Kent Company to undertake the work. The town commissioners had obtained an Act of Parliament in 1808 empowering them to provide a public water supply, but after trying their hands at it for two years they offered to sell their works and land to the Kent Company. The Government also contracted for the supply of their extensive establishments at Deptford, Greenwich, and Woolwich. The expense occurred in providing these and other extensions of supply in response to the public demand was so great that for many years the company paid no dividends, and when any were paid, they were so small and irregular that the shares became almost unmarketable. Nevertheless the company continued to enlarge and improve its works out of income, and after some forty years of struggling emerged into a more prosperous condition. About 1855 the Ravensbourne became inadequate to the increasing demand, and the first deep well was sunk. In 1862 the river was given up altogether, and since then the water has been pumped wholly from the chalk.

CHAPTER III

GROWTH AND IMPROVEMENT OF SUPPLY

THE historical sketch contained in the last chapter explains how London came to be under the dominion of the eight water companies. They were established with the sanction and by the authority of Parliament to do what no public body would undertake, and supply different parts of the metropolis and its suburbs from time to time as the demands of an increasing population in each locality became urgent. That is why there are so many of them, and why their jurisdiction extends so far. When they were formed London had not been welded into the huge conglomeration of towns which it now is, but consisted of the City and the Borough with various outlying townships and hamlets separated from each other by open spaces. As each locality grew in importance it ceased to be satisfied with the primitive methods of supply and required water laid on. Private enterprise responded to the demand in the shape of a fresh company. After the City came the East-end hamlets—Wapping, Mile End, and Stratford—then Chelsea, followed by Southwark,

Lambeth, Paddington, Kensington, Fulham, Hammersmith, Putney, Greenwich, and so on. The eight existing companies really represent many more smaller local concerns which they swallowed up, and their growth for a long time was less outwards than inwards towards each other as the intervening spaces were built over. Of late years the fringe has been pushed further and further outwards in all directions, and as it has moved the companies have been called upon to extend their supplies with it. Some extension has also been caused by the removal of works and intakes further afield, as the places to which the works have been moved, such as Hampton and Molesey, have taken advantage of their presence to be themselves supplied from the same source.

In short, the whole thing is the outcome, not of rule, but of circumstance, like most other institutions in this practical *solvitur ambulando* country of ours. Starting on the principle of locality, fairly well defined, the water supply has by force of circumstance outgrown all such shackles, and following the law of supply and demand, tempered by Parliamentary control, has reached its present rather amorphous condition. Of course it is an anomaly, whatever that may mean. Some people appear to attach a sinister significance to this mysterious word; but as nearly all the best things we have are anomalies, it does not matter very much.

The growth of the companies' business during the

present century has been prodigious and far more than commensurate with the growth of population, as needs have increased as well as numbers. They started, as has been shown, in a modest way, with a capital of from 30,000*l.* to 80,000*l.* in the case of most. In 1897 there was not one that had not expended over 1,000,000*l.*, and the total capital expended stood at 17,214,571*l.* All this money—and a good deal more from income—had been spent from time to time on works for extending and improving the supply. A few figures may be given to illustrate the increase in quantity. In 1809 the East London Company were supplying 10,739 houses with an average quantity of 54 gallons a day: in 1897 they supplied 190,594 houses with 215 gallons a day. In 1785 the Lambeth Company had 629 houses on their list; in 1897 they had 106,888. In 1811 the water rental received by the West Middlesex Company was 335*l.*; in 1897 the gross rental amounted to 269,479*l.* It would be useless and tedious to recount the successive steps in the development of these huge undertakings or to enumerate the works constructed over a long series of years—the pumping-stations, reservoirs, filter-beds, trunk mains, deep wells, &c. which represent the value of all those millions expended. But one thing should be borne in mind, namely, that every step was taken with the sanction of Parliament and with more than public approval—rather at the public demand. The

Acts passed to authorise the raising of fresh capital and the construction of fresh works must considerably exceed 100, as most of the companies have fifteen or sixteen to their share ; and, in addition, the Legislature has dealt with the question of the water supply deliberately and at its own instance. It has passed general Acts—of which more later—defining the rights, the powers, and the duties of the companies. Their expansion, therefore, to their present position has taken place in the full light of day.

That expansion has been accompanied by an equal improvement in the supply ; and it is only fair to say that the companies have never needed compulsion in this respect. In many instances one or other of them has taken the initiative in introducing important improvements, and when suggestions have been made from outside or have been adopted by Parliament, they have always been promptly and energetically carried out.

Originally, as has been shown in the last chapter, the supply consisted mainly of water pumped from the Thames between London Bridge and Chelsea, and delivered as it was. They had the Hertfordshire springs in the City, the tidal Lea in the East-end, the Ravensbourne down at Greenwich, and one or two brooks on the Surrey side ; but the Thames, as it flowed through London, was the real source of supply to the greater part of the population. It was, of course, much cleaner then than it

is now, but it could not have been very clean either. The notion that the Thames at London was once a pellucid stream is a cockney delusion. No tidal river on our coasts is pellucid. The Severn, the Humber, the Ouse, Trent, Wye, and other rivers, which are virtually unpolluted, are all as thick as mud from the scour of the tide, and so was the Thames in the time of the Romans. It could not have been very nice to drink at any time; but at the beginning of the century people were less particular than they are now, and, being accustomed to the Thames water, were glad enough to have it laid on instead of buying it by the bucket as they used to do. Down to the year 1893 the great city of Hamburg drank precisely such water without any attempt at purification whatever. It is therefore not surprising that in the first quarter of the century London was more concerned about getting the water at all than about its quality. Thus in 1821—so early were the companies subjected to the ordeal of special inquiries—a Committee of the House of Commons reported that ‘a material improvement had taken place in the supply, both in respect of abundance and certainty.’

However, it was not long before the inevitable progress of public opinion began to demand further improvements. Having got the water, people wanted it first cheaper and then better. And they got it. The companies voluntarily reduced their rates in

accordance with a recommendation made by the 1821 Committee; and this had not been done long when the question of purity began to come to the front. It was agitated by writers, and notably by a pamphlet entitled 'The Dolphin,' and published in 1827, in which it was pointed out that 'the water taken up from the river Thames between Chelsea Hospital and London Bridge for the use of the inhabitants of the metropolis, being charged with the contents of more than 130 public common sewers, the drainings from dunghills and lay-stalls, the refuse of hospitals, slaughter-houses, colour, lead, gas and soap works, drug-mills and manufactories, and with all sorts of decomposed animal and vegetable substances, rendering the said water offensive and destructive to health, ought no longer to be taken up by any of the companies from so foul a source.' A Royal Commission of experts was appointed in 1828 to investigate the question of purity. Their report spoke favourably of filtration as a possible remedy, but recommended a change of intake, stating that 'many of the complaints respecting the quality of the water were well founded,' and that it was 'susceptible of and required improvement.'

No action was taken by Parliament on this rather vague pronouncement, but the companies set to work to give it practical effect, and within a few years all those concerned had either moved their intakes higher up or constructed subsiding reservoirs

or filter-beds. Filtration on so large a scale had never been tried before, and the credit of playing the part of a pioneer in this greatest of all hygienic advances belongs to the Chelsea Company. Subsiding reservoirs had been built nearly twenty years before by the East London Company, but they now moved up the Lea above the tide. The Grand Junction moved up to Kew and presently adopted filtration in addition. The West Middlesex already had their intake at Hammersmith, and only found it necessary to build some large subsiding reservoirs. The Lambeth did the same. The Southwark and Vauxhall had not yet been formed, and the New River and Kent were not concerned.

The improvements effected by the companies drawing from the Thames, however, did not suffice for very many years in the face of that remarkable sanitary advance which was called drainage and consisted in conducting every kind of filth straight into the river in pipes. The Lambeth Company, which was at that time in the worst position, now took the lead, as already stated in the last chapter, and moved bodily up to Long Ditton, far above the tideway. The Act empowering them to do so was obtained in 1848. The water question was again very much in the air at this time, and for one reason or another occupied a great deal of attention. The Board of Health was concerned about the hardness of the Thames water, and published a report

suggesting Bagshot Sands as a source of supply. Then there was the cholera, and the Government, playing up to the good old rule—when in doubt appoint a Royal Commission—appointed one to inquire into the chemical aspects of the subject. It reported in favour of the Thames above the tideway, and of a supply from the chalk. The water of the river was pronounced ‘perfectly wholesome, palatable, and agreeable ; uniform, plentiful, and safe in use.’ The result of all this was the very important Metropolis Water Act of 1852.

These events mark a turning point in the history of the water supply, and merit particular attention. London had then been fairly under the régime of the companies for some forty or fifty years, and during the last thirty the water question as a whole had been before the public on very much the same footing as it is to-day. The time was long enough for a fair trial of the companies, but not so long as to make their abolition in favour of some public authority a matter of any great difficulty if it had been thought desirable. At this juncture what happened? First, a careful public inquiry, which deliberately adopted the existing sources of supply with certain suggestions for improvement; and secondly, an Act of Parliament, solemnly accepting the companies as the recognised purveyors of water, and laying down specific conditions for their guidance and control. They were thus not merely

confirmed in their position by the authority of the Legislature after the most mature deliberation, but were bound to raise some millions of additional capital for the express purpose of carrying out the views of Parliament. The Act was at once a proof of public confidence, a charter of rights, and a guarantee of fair treatment; for if any people were ever induced to trust their money to the good faith of the British Parliament, it was those who then invested in water shares.

The chief provisions of the Act were these: All Thames intakes to be moved above Teddington; all reservoirs within five miles of St. Paul's to be covered; all water for domestic use to be filtered, unless pumped from wells; no new sources to be adopted without the approval of the Board of Trade; complaints as to quantity or quality to be the subject of investigation by the Board of Trade. The companies were given three to three and a half years to carry out the necessary works; and they not only did it, but did it well. In 1856 the Board of Health issued a highly satisfactory report upon the manner in which they had fulfilled their duties, and on the resulting improvement in the quality of the water.

Since that time the water supply of London has been the subject of increasing surveillance and control. Numerous public inquiries have taken place, all of which have gone to confirm the action

of Parliament in 1852 with regard to the sources of supply. The ceaseless progress in sanitary science during the last forty years has caused constantly increasing attention to be paid to this question, but the general quality of the water provided by the London companies has emerged successfully from every serious investigation down to the present day. In 1867 a Committee of the House of Commons was instructed—no doubt on account of the cholera in 1866—to make special inquiry into the condition of the two rivers and into the operation of the Act of 1852. Its report was a strong vindication of the companies and a confirmation of the policy of Parliament. The satisfactory character of the water supply was affirmed and made the ground for maintaining the previous arrangement. About this time several ambitious schemes were being brought forward and dangled before the public, apparently in imitation of the Glasgow Loch Katrine enterprise. Water was to be brought from Cumberland, from Lake Bala, and elsewhere. These schemes were placed before the Duke of Richmond's Commission in 1869 and examined in detail, but the Commissioners took the same view as the Committee of 1867 and pronounced in favour of the existing sources, though they complained that filtration was not efficiently performed.

A favourable verdict on all counts was once more pronounced twenty five-years later by Lord Balfour's

Commission; but this important inquiry will be separately discussed in a subsequent chapter.

Meantime we have a history of continuous improvement attested by the systematic examination of the water, which was instituted by Government under an Act passed in 1871, and—still more convincingly—by the steady reduction of water-borne disease. The improvement has been in two respects—the provision of a constant service, and the increased efficiency of filtration. With regard to the constant service, the Act of 1871 provided that every company might or, if required, should give a ‘constant supply of pure and wholesome water,’ under specified conditions. The conditions imposed certain obligations on consumers, with a view to the prevention of waste, and until they were fulfilled the constant supply could not be given. Its introduction, therefore, has necessarily been gradual, and it has taken place entirely on the initiative of the companies themselves. The Act gives power to the ‘Metropolitan Authority,’ which is now the County Council, and also to the Local Government Board, to require the companies to give such a supply; but the power has been rarely, if ever, used. It has not been needed, as the companies have always been more ready to give the supply than consumers to comply with the regulations for taking it. The East London led the way in effecting this important improvement, and the whole of its area is now under

that system, as are those of the Grand Junction and the Chelsea. The rest are very little behind, with the exception of the Lambeth. The constant service is of even greater value for the extinction of fire than for domestic consumption.

The improvement in quality due to more efficient filtration is mainly the outcome of increased knowledge, of which the companies have readily availed themselves. Sir E. Frankland, the Government analyst, has borne emphatic testimony to the progress made in the last thirty years. In his report for 1890 he gave a table contrasting the analyses of that year with those of 1868, and added: 'This table strikingly shows the enormous improvement which the water companies have effected in filtration since I first began these examinations for turbidity in 1868.' The progress thus shown in the art of treating river water has been further assisted in the case of the Lambeth and the Chelsea Companies by the voluntary removal of their intakes still higher up the river, subsequent to the general change of 1852. Nor should it be forgotten that, in addition to the regular examination conducted by the Local Government Board, the companies have for several years themselves maintained an independent daily analysis by the most eminent chemists, as an earnest of their anxiety to secure a high standard of purity. It would puzzle any one to say what more they could have done in this direction.

To summarise the historical retrospect contained in this and the previous chapter, I submit that the facts, which cannot be gainsaid, entirely disprove the notion that the companies have been public enemies in the past, or have attained their position by any underhand influence. They came to the rescue of the people when no one else would; they risked their money on a bold enterprise, which was greatly to the public advantage, and recognised as such; for many years most of them made no profit; they struggled on, continually improving and extending the supply; they accepted the criticisms of the Committee of 1821 and the Royal Commission of 1828, the one upon their charges, and the other upon the quality of the water, and they voluntarily acted upon both; they carried out in a prompt and thorough manner the wishes of Parliament embodied in the general Acts of 1852 and 1871; and they have since maintained a systematic examination of their water, made by the most eminent chemists, whose analyses are published every month.

It is only fair to say so much as this. Whether it is expedient that the water supply should be in private hands is another question altogether, with which I shall deal later. The point I wish to insist on here is that, as purveyors of water, the Metropolitan companies have a very good record. No doubt, their chief object has been to make money, but that is not incompatible with good public ser-

vice, and it does not follow that the public have not had their money's worth in return. It is said that they defeated the intentions of Parliament which established them in order to compete with one another. Broadly speaking, that contention seems to me quite incompatible with the historical facts. It rests upon the fact that the companies established at the beginning of this century were granted powers to supply certain parishes in which the older companies already had rights. This implies a recognition of the principle of competition, but no more. As a matter of fact, the areas of the older companies were very ill defined, and the parishes in question, though nominally within their spheres, were being supplied only in part or not at all. For instance, before the Grand Junction was formed, those interested sent an engineer into Paddington and Marylebone, where the New River had nominal rights, to make inquiries; he found that people were without water and that rates were no object provided they could get it. So the company was formed for supplying them, and presently it began to compete with the New River. Similarly the West Middlesex, formed to supply Fulham, Hammersmith and Kensington, pushed up into Marylebone and competed there. Again, the East London entered into competition with the New River upon the outskirts of their area. This went on between 1811 and 1815 or 1817, when the

companies came to an informal understanding to drop competition. They then began to raise their rates, an outcry followed, and in 1821 a Select Committee was appointed to inquire into the whole question. It reported against competition and in favour of fixing rates by law, which was subsequently done. Rates were fixed by Parliament for the Grand Junction in 1826, the East London in 1829, and the rest later ; non-competition was thereby deliberately recognised, and in 1852 six companies, having private Bills before the House, were put under obligation to lay pipes and extend the supply in their respective districts, as and when called upon, subject to the following proviso :

Provided that the company shall not be bound to furnish any such supply of water, or lay down any pipes for such purpose, in any part of the district, which part is for the time being supplied with water by any other company.

In the face of this it is difficult to see how the charge of baulking the intentions of Parliament can be sustained. No doubt the companies have needed criticism from time to time to keep them up to the mark ; but they had it in abundance. No water supply was ever so often investigated or so carefully controlled. Nor have the companies ever objected to fair criticism and investigation. Their readiness to afford every information has been frequently recognised in complimentary terms by those conducting official inquiries.

CHAPTER IV

THE PRESENT SUPPLY

THE area over which the eight water companies have Parliamentary powers of supply is conveniently known as 'Water London.' It is an irregular area corresponding with no official administrative boundaries, being far larger than 'Registration London,' and somewhat smaller than the 'Greater London' controlled by the Metropolitan Police. Its total extent is 620 square miles, of which only 120 are within the County of London. The rest includes parts of Middlesex, Hertfordshire, Surrey, Kent, and Essex. It is this wide distribution over several districts enjoying independent local government which constitutes the greatest difficulty in the way of substituting a public authority for the companies. And when the future is regarded, that difficulty becomes all the greater, because the increase of population is taking place more and more in the outside areas, which will eventually surpass the County of London. Nor can any one foretell what the relative share of each administrative district will be, because the tide of population sets now in this direction, and now in

that, in obedience to laws the action of which cannot be foreseen or controlled. This, however, is by the way.

SPHERES OF THE COMPANIES

The companies do not actually supply water over the whole 620 square miles, as several outlying localities are otherwise provided. The extreme limits of their actual supply are:—To the north, Amwell, near Hertford ; to the south, Croydon ; to the west, Hampton ; to the east, Ilford on one side of the Thames and Dartford on the other. The total estimated population at the present time is about 5,800,000. It is impossible to describe the boundaries of each company, but, roughly speaking, their respective spheres are as follows:—The East London Company starts from the Minories and supplies the East End, the Eastern and North-Eastern suburbs ; the New River, adjoining it, has the City and the W.C. district, and thence runs due north through Islington, Camden Town, and Highgate ; the West Middlesex has the north-west coming down through Marylebone to Oxford street ; the West End is shared by the Chelsea and the Grand Junction, which also supplies the western suburbs as far as Hounslow and Hampton ; to the south of the Thames the whole riverside population from Kew to Rotherhithe is served by the Southwark and Vauxhall ; behind that and extending as far

south as Croydon is the Lambeth; and finally, the Kent Company takes the whole South-Eastern district. The only part of London having a conjoint supply is a small area embracing portions of Southwark, Lambeth, and Newington, where the two companies, after quarrelling vigorously for some years, to the great satisfaction of their feelings and the detriment of their business, finally came to an amicable settlement in 1847.

QUANTITY OF WATER SUPPLIED

The following table gives the sources of supply the estimated population, and the average daily amount supplied by each company in 1897 :

Company	Population	Average daily supply in gallons	Average daily supply per head	Sources
East London .	1,274,735	41,036,906	32·47	Lea, Thames, and wells
New River .	1,183,000	35,974,488	30·58	Lea, wells, and springs
Southwark and Vauxhall	812,822	33,767,401	41·72	Thames and wells
Lambeth .	674,456	23,688,305	35·52	Thames
W. Middlesex .	605,505	20,337,018	33·81	"
Kent .	518,340	15,482,056	30·22	Wells
Grand Junction	400,846	19,532,580	49·03	Thames
Chelsea .	273,662	12,283,789	44·35	"
Totals .	5,748,366	202,102,543	35·42	—

With regard to sources the total daily supply is, roughly speaking, divided as follows : Thames,

120 million gallons ; Lea, 50 million gallons ; wells, 32 million gallons ; but in dry seasons less is taken from the Lea and more is pumped from wells. In the height of summer the daily quantity pumped is far greater than the average given in the preceding table. For instance, in July last it was as follows :

East London	44,959,000 gallons
New River	42,694,436 „
Southwark and Vauxhall	36,931,031 „
Lambeth	27,529,929 „
West Middlesex	23,917,011 „
Kent	17,967,568 „
Grand Junction	22,647,111 „
Chelsea	13,225,278 „
Total	229,871,364 „

The total amount was made up as follows : Thames, 130,280,800 gallons ; Lea (including storage reservoirs), 49,644,660 gallons ; springs and wells, 49,943,940 gallons ; together with a small quantity drawn from ponds and not used for domestic consumption.

A very important point to bear in mind is that the amount that may legally be drawn from the two rivers is strictly limited. With regard to the Thames the history of the matter is this. So long as the companies drew from the tidal river, which they all did till 1848, there seems to have been no restriction as to quantity ; but when, in 1847, the Lambeth Company proposed to go above Teddington Lock, the Corporation, who were then Conservators

of the river, opposed the step and exacted an undertaking from the company not to exceed 20 million gallons a day. That was one of the conditions under which the Act of 1848 was obtained empowering the company to remove their intake to Long Ditton. In 1852 the Metropolis Water Act was passed, forbidding any of the companies to draw water from the tidal river (*see* p. 34); and when in conformity with that provision the remaining four—the Chelsea, Grand Junction, West Middlesex, and Southwark and Vauxhall—applied for powers to go above Teddington Lock, the Corporation took the same action as with the Lambeth, and bound each company not to exceed 20 million gallons a day. No doubt the Conservators were only doing their duty in safeguarding the river, but this was the first step in that policy of restriction and interference which has since led to such great difficulties. The companies were first ordered to go to a certain part of the river, and then forbidden to take more than a certain amount of water in each 24 hours.

In 1857 the Conservancy Board was substituted for the Corporation, and inherited the agreements with the water companies. In 1866 the companies became bound to pay the Conservancy Board 1,000*l.* a year each in consideration of being allowed to take the 20 million gallons a day. The restriction as to quantity was subsequently embodied in Acts of Parliament in the case of the West Middlesex and

Chelsea Companies and so became statutory, but remained a matter of agreement with the others. In 1886 the Conservancy entered into fresh agreements with the companies, under which they were allowed to take an additional 20 million gallons a day, divided among them in the proportions of 2 million to the Chelsea, and $4\frac{1}{2}$ millions to each of the others. They thus became entitled to the following amounts:—

Chelsea	22 million gallons
West Middlesex	$24\frac{1}{2}$ „
Grand Junction	$24\frac{1}{2}$ „
Lambeth	$24\frac{1}{2}$ „
Southwark and Vauxhall	$24\frac{1}{2}$ „
Total	120

In addition to this amount the East London Company was empowered to take 10 million gallons daily under an Act passed in 1867. Until quite recently, therefore, the companies were restricted to a total amount of 130 million gallons a day, for which they paid 17,950*l.* per annum to the Conservancy. The Chelsea, West Middlesex, and East London were bound by statute not to exceed their respective limits, the others only by agreement, which has, however, been held by the High Court to be binding in law.

The authorised total of 130 million gallons a day was raised to $150\frac{1}{2}$ millions by an Act passed last Session empowering the Southwark and Vauxhall to

draw an additional $20\frac{1}{2}$ million gallons a day under certain conditions. Further, when the reservoirs which are being constructed at Staines by the New River, Grand Junction, and West Middlesex Companies conjointly are completed—say in about four years' time—then those three companies will be entitled under the Staines Reservoirs Act of 1896 to take an additional 35 million gallons a day, bringing the total amount authorised to be drawn from the Thames up to $185\frac{1}{2}$ million gallons. But it is incorrect to represent this amount as authorised at present.

The intake of the East London Company is above Sunbury Lock, those of all the others are lower down, between Sunbury and Molesey.

The companies that draw water from the Thames are forbidden to supply it outside their own Parliamentary limits. This restriction obviously has a very important bearing on the question of inter-communication and intersale, of which so much has recently been heard.

With regard to the Lea, the legal position is governed by the River Lea Water Act of 1855, under which the Conservancy has first claim to 5,400,000 gallons, or as much as may be necessary to keep up the head of the river for navigation. After that the New River and East London Companies have equal rights to the rest, but the former have a preferential draught. Their intake is between Hertford and

Ware, above the navigable part of the river. It is their practice to take only $22\frac{1}{2}$ million gallons or less, as they have a large number of chalk wells. The East London's intakes are about 20 miles lower down, at Enfield Lock and Ponder's End. The company take as much as they require, which is usually about 30 million gallons a day, or when the river is low as much as the New River leave over. In dry summers the supply taken directly from the river has to be largely supplemented from storage reservoirs. All the water from the Thames and Lea is filtered.

With regard to deep wells in the chalk, the New River have fourteen, from which a variable amount is pumped, running up to 26 million gallons a day. The Kent Company, whose whole supply is derived from this source, have sixteen wells, from which they pump a maximum quantity of 18 million or 19 million gallons a day. The East London Company have five wells, from which about 10 million gallons can be pumped. The Southwark and Vauxhall Company have also one or two wells from which they get a small quantity.

As for springs, there is the old Chadwell spring belonging to the New River Company, which sometimes yields as much as 3 million or 4 million gallons a day, but cannot be relied on in dry seasons. In 1891 it produced less than half a million gallons for some weeks, and it has since fallen still lower. In the autumn of 1898 it dried up altogether. There are

also gravel springs near the Thames from which several of the companies draw a varying quantity of water, but they are more properly included in the river supply.

The following table gives some details of the works belonging to the several companies :

Company	Storage and subsiding reservoirs, in gallons	Filtered water reservoirs, in gallons	Filter beds, acres	Engines, horse- power
East London .	1,215 millions	20 $\frac{2}{3}$ millions	31	5,590
New River .	168 „	37 $\frac{1}{2}$ „	16 $\frac{1}{2}$	3,820
Southwark and Vauxhall .	136 „	19 „	20 $\frac{1}{2}$	3,200
Lambeth .	128 „	28 $\frac{2}{3}$ „	12 $\frac{1}{4}$	3,665
W. Middlesex .	397 $\frac{1}{2}$ „	19 $\frac{1}{2}$ „	15	3,325
Kent .	—	13 $\frac{1}{2}$ „	—	1,795
Grand Junction	64 „	76 „	21 $\frac{3}{4}$	3,716
Chelsea .	140 „	11 „	8	1,475
Totals .	2,248 $\frac{1}{2}$ „	226 „	125	26,586

The total length of the water pipes owned by the companies is 5,238 miles. It is frequently stated by those who are anxious to depreciate the value of the companies' works that the plant is worn out, that the reservoirs leak, the pipes are rotten, and that the whole concern is ramshackle and broken down. These statements are never made by engineers, and rest upon no evidence whatever. There is not a single word of truth in them. Sir A. Binnie, giving evidence before the Royal Commission in January 1898, said—'I give the London water companies credit for having kept their works up to the proper standard of modern requirements.'

QUALITY OF WATER SUPPLIED

Scientific opinion upon the potability of water, as on most other sanitary questions, is being continually affected by advancing knowledge, and no man can foretell what views may be held five or ten years hence. The constant progress of bacteriology has an especial tendency to modify articles of faith once held inviolable. It alters our notions of what true cleanliness is and how it can best be attained. Speaking generally, however, we should no doubt say that the purest water is that which starts pure and remains uncontaminated before delivery, such as the water pumped directly from chalk wells or springs to the consumer. But chemical purity and physiological safety are not necessarily the same thing, and the drift of modern research is to show that river water, although contaminated, may be made under certain conditions almost as pure chemically as the other, and even safer physiologically. Those conditions are a relatively large body of water, flowing slowly, and therefore fully exposed to the light, sedimentation in subsiding reservoirs, and filtration through sand. The largest waterworks that have been constructed since these views gained acceptance are those at Hamburg, which were completed in June 1893. The system adopted there is to take the raw water from the tidal Elbe, which is

of very much the same colour and character as the Thames at London Bridge—if anything more polluted—and pass it through subsiding reservoirs and sand filters. The plan was deliberately adopted in preference to a proposed scheme for bringing pure water from the Holstein lakes, and it has been entirely justified by results. The water supplied is of great purity, and the effect of treating it in the manner described has been an astonishing improvement in public health. I have mentioned this specific example, because it seems to confirm the accuracy of current scientific opinion more convincingly than any amount of theoretical discussion. The Hamburg authorities acted under the very highest advice, and they had before them the remarkable case of Altona, which in itself proved, beyond the possibility of denial, the absolute efficiency of sand filtration in securing physiological purity. Altona is continuous with Hamburg, but lower down the Elbe. It gets the whole of the sewage of both places. Yet in the great cholera year of 1892, when the river was a mass of cholera poison, Altona, although more exposed than Hamburg, entirely escaped an epidemic outbreak, simply because its water was filtered.

Now in London the conditions are far more favourable, and the public has every reason to place entire confidence in the quality of the water supplied. It should be good in theory, and it is so in fact. It is systematically watched and examined on behalf of

the Government, under the Act of 1871, and independently by some of the most eminent men of science living; and both authorities concur in giving it a high character. No water is so carefully safeguarded or subject to such elaborate supervision. But far more weighty proof of its quality than any amount of scientific examination is afforded by the test of experience. For upwards of thirty years no sickness whatever has been traced to the London water, and the steady diminution of water-borne disease is a fact which no academic discussion can over-ride. At the same time it is quite possible that progress in knowledge may point out the way to securing purification with greater certainty, if not with greater efficiency, and should that be so, it would be the duty of the companies to adopt such means without delay. They have never shown themselves backward in effecting improvements, as their history sufficiently proves; but if they failed to do their duty in this respect the Government has the power to put pressure upon them. At present the theory of filtration has not been thoroughly worked out, and opinions differ with regard to the materials and the depth of the filtering layer to be used. It is pretty well established, however, that the most important factor in arresting and destroying the dangerous elements present in water is the coating of living vegetable matter which forms on the surface of the filter-bed like a mat, and consequently

that the time when purification is least efficiently performed occurs immediately after the bed has been cleaned. This points to the advisability of rejecting the first water that passes after cleaning, just as the first water in high floods is rejected or allowed ample time to settle. Possibly science may before long demand this precaution, which seems in the light of present knowledge more likely to answer than mere increase in the depth of the filtering material. Another suggestion that has been made is that filter-beds should be allowed a periodical rest for aëration in order to increase their efficiency. A double system of filtration has also been proposed. To discuss these points would be to go beyond the scope of this book, but their mention will show that the subject is still in an unsettled condition. The main thing is that, as a matter of fact, purification is carried out as efficiently by the water companies as it is by any one else, and that the London supply is actually a good and wholesome supply according to all existing criteria. Its quality compared with other supplies will be discussed in the next chapter.

FINANCES OF THE COMPANIES

It remains to give some account of the financial position of the companies. The following figures are taken from Lass's tables for 1897 :

Company	Share and loan capital authorised	Authorised capital raised	Total capital employed
	£	£	£
East London . . .	3,465,000	2,975,969	3,081,141
New River . . .	3,909,958	3,646,767	3,713,482
Southwark and Vauxhall . . .	3,388,478	2,849,689	2,897,631
Lambeth . . .	2,290,000	1,851,141	1,902,094
West Middlesex . .	1,795,066	1,564,294	1,641,864
Kent . . .	1,050,000	950,000	1,009,567
Grand Junction . .	1,625,000	1,550,000	1,778,460
Chelsea . . .	1,318,750	1,284,425	1,293,415
Totals . . .	18,842,252	16,672,285	17,317,654

All the share and loan capital has been raised under successive Acts of Parliament, except the New River shares, which are freehold and established by charter. The total share capital amounts to 10,228,548*l.*, and no more is allowed to be raised. All capital raised since 1886 is debenture stock, and is subject to auction clauses and to the creation of a sinking fund. The total amount of bonds and debentures is 5,402,060*l.*

The following table gives the income, cost of

management and maintenance, net profit, and dividends paid:

Company	Income			Maintenance and management			Net profit			Dividends
	£	s.	d.	£	s.	d.	£	s.	d.	
East London . . .	323,588	11	2	131,854	9	0	144,165	6	0	7-7½
New River . . .	559,097	6	1	226,670	6	3	270,036	1	8	—
Southwark and Vauxhall . . .	253,827	10	11	108,188	17	3	75,620	13	11	5-6
Lambeth . . .	267,195	6	0	103,148	12	1	145,811	17	1	{ 7½-9½ 7½-10
West Middlesex . . .	239,967	19	0	104,832	11	10	122,305	0	8	10-10
Kent . . .	167,062	2	8	58,894	17	1	105,370	16	0	10-7
Grand Junction . . .	203,433	3	2	99,179	5	6	92,243	19	5	7½-7
Chelsea . . .	157,096	19	8	51,990	12	5	82,444	5	5	10-10
Totals . . .	2,171,268	18	8	887,759	11	5	1,037,998	0	2	

The average income is 7*d.* per 1,000 gallons supplied, and 2*l.* 10*s.* per house. In the East London district the income for domestic supply only averages 3*l.* per house. Dividends are limited by Act of Parliament to 10 per cent. Any surplus profit beyond this is applied to the reduction of rates. In the West Middlesex district consumers already get a reduction of 10 per cent., and last year the Chelsea Company also reached the limit. The dividends paid by the companies seem to be a great rock of offence. No argument is so frequently used to excite the indignation of consumers. But in common fairness certain facts should be remembered. If the water companies are regarded in the light of corporate bodies having a continuous existence since their formation, then their previous circumstances must be borne in mind. They represent capital risked to

supply the public needs which no public authority would consent to do ; and they are therefore entitled to the reward of their enterprise, which for many years yielded no return, and is now prohibited from enjoying the full results of success. If, on the other hand, they are regarded as agglomerations of individual shareholders, then it must be remembered that most of those shareholders have bought their holdings at a high premium commensurate with the dividend paid, and are consequently receiving but a modest return on their investments. Moreover, a particularly large proportion of the money forming the capital of the London water undertakings happens to be the trust money of widows and orphans, which has been invested in this security on the faith of Parliament. There is always a great outcry when innocent investors are defrauded through the false representations of a company promoter ; no words are bad enough for such heartless rogues. It is singular that the professed champions of the people, in their zeal for the public welfare, should be urging Parliament, which represents the people, to perpetrate an equally heartless act of cruelty, by breaking faith with innocent individuals, and robbing the helpless of their livelihood. For that is what those are doing who demand either the compulsory purchase of the water companies' business at a price far below its market value, or the permission of Parliament to introduce a competitive supply.

I am free to speak out on this point, because I have not a pennyworth of interest, direct or indirect, in the fate of the water companies. To me it is merely a matter of common justice and fair dealing.

CHAPTER V

LONDON COMPARED WITH OTHER TOWNS

ONE of the commonest and most telling complaints about the present supply is that it compares very unfavourably with that of other large towns. Nothing is more justly irritating to the public anywhere than the feeling that its interests are neglected, and that the public elsewhere is much better served. When, therefore, the Londoner is told, as he is persistently told, that other towns have a vastly better and cheaper water supply, he rises to the bait and wants to know why this should be. Then he is told that it is all because of the companies, and that if they were got rid of, things would be very different. Well, they might be; but meantime let us examine the facts about the superiority of other supplies.

The three main points are (1) quantity, (2) quality, (3) cost.

(1) *Quantity*.—Figures for a number of foreign cities have been given from time to time, but they are of little value for comparative purposes, unless the other circumstances are known. As a matter of curiosity, however, the following table of European,

American, Canadian and Australian towns, prepared from figures given some years ago by Sir J. Bazalgette, may be found interesting. They show the daily supply per head of the population in gallons.

London	31 $\frac{1}{4}$	Barcelona	7-14
Paris	36	Rotterdam	22
Berlin	13	Genoa	24-97
Vienna	13-20	Venice	8
St. Petersburg	21	Frankfort	24
Rome	160	Seville	7
Madrid	3	New York	60
Stockholm	13 $\frac{1}{2}$	Philadelphia	54
Hague	17	Boston	73
Budapest	12-33	Chicago	102
Copenhagen	13	Baltimore	54
Christiania	39	San Francisco	64 $\frac{1}{2}$
Athens	21 $\frac{1}{2}$	Washington	143
Amsterdam	11	Ottawa	102 $\frac{1}{2}$
Hamburg	45	Montreal	60
Naples	15	Toronto	82
Dresden	15	Sydney	25
Marseilles	158	Brisbane	33 $\frac{1}{2}$
Hanover	15	Adelaide	50
Munich	33		

London, it will be observed, compares very well with most of the European capitals. As for the cities with very large supplies, the water in all cases is unfiltered, and the typhoid fever death-rates will be found to be very high. That is particularly the case with the American cities, which are frequently cited as examples to London. The average typhoid mortality per 100,000 living for the twenty-eight chief American towns is about 50, whereas in London the rate is only about 12. It is obviously

absurd to compare filtered with unfiltered water. The great rivers and lakes in the American continent, draining millions of square miles as they do, afford a really unlimited supply, particularly when the expense of purifying it is avoided. Wherever filtration is adopted the supply is at once checked, because this lavish use becomes expensive. The best filtered water of all is that given in the Dutch towns, and there the supply per head is small. Nor is there any object whatever in providing water beyond thirty or forty gallons per head. All the rest is sheer waste, and only makes the sewage more difficult to deal with. Giving evidence before the Balfour Commission, Sir Frederick Bramwell put the amount required for all purposes at twenty-five to twenty-seven gallons. Mr. Hawksley put it at twenty-five, and Mr. Baldwin Latham, who had tested the quantity used in his own house for some years, including copious baths and garden watering, found that the daily consumption did not come to twenty-two gallons per head.

This is the reason why provincial towns in England, where waste is prevented by drastic regulations, are able to maintain a constant supply with so much less water than the Metropolitan companies. For when we come to compare these towns with London—which is much more to the point than comparing foreign countries, where the conditions are totally different—we find that the greater majority

of them have a very much smaller supply in proportion to the population. The current statements to the contrary, which we hear so often, are absolute fictions fabricated for the sole purpose of exciting odium against the water companies. Here are the actual figures for London and twenty-four large towns during the hot weather last August, which formed an admirable test of the capacity of the several water authorities to answer to the public need in a period of stress. Excepting Bristol all the towns mentioned have a municipal supply. The figures were furnished by the respective engineers.

	Gallons per head		Gallons per head
Brighton	43	Bristol	23 $\frac{1}{2}$
Plymouth	43	Bolton	23 $\frac{1}{2}$
Hull	43	Birmingham (average) .	23
Bradford	35	Huddersfield	23
Leeds	35	Burnley	23
Preston	34	Oldham	22
Liverpool	31 $\frac{1}{2}$	Cardiff	22
Croydon	31	Sheffield	21 $\frac{3}{4}$
Manchester	30	Nottingham	19
Halifax	29	Birkenhead	18
Swansea	28	Leicester	18
Blackburn	25	Wolverhampton	17 $\frac{1}{2}$
LONDON	38 $\frac{1}{2}$		

That is to say, twenty-one out of the twenty-four towns, including all the largest, have a supply inferior in quantity to London. Three London companies, indeed, give a larger supply than any of the whole twenty-four, namely, the Grand Junction, Chelsea, and Southwark, which supplied respectively 53·2,

44·7, and 43·9 gallons per head. But it is better to take London as a whole and average the quantities given in different districts, because the consumption per head varies in a similar manner in different parts of other towns, but the returns only show the average.

The foregoing figures give the consumption for all purposes. If the domestic consumption alone be regarded, the comparison is still more in favour of London, because a much larger proportion is required for trade purposes in the industrial towns. For instance, the domestic consumption in London in the height of summer is fully thirty gallons per head ; in Bradford it is fifteen, in Birmingham fourteen, in Sheffield thirteen, and so on. The London household consumer gets in fact about twice as much water for use from the villainous companies as the inhabitants of the large provincial towns get from their municipal authorities. The one stock example to the contrary is Glasgow, which has a very large and cheap supply ; but then Glasgow does not filter its water, and the typhoid death-rate is double that of London.

(2) *Quality*.—A good deal has already been said upon this subject, and it is not necessary to add much. There are no returns which give a satisfactory comparison of purity, as shown by chemical analysis, between the London waters and any considerable number of others ; but the monthly report of the

Government Water Examiner for London contains also the results of analysis made for Birmingham and Glasgow by the local official analysts. An examination of these returns shows that both Birmingham and Glasgow waters contain more organic carbon than the London samples, and the Birmingham more organic nitrogen. I append a few recent examples taken at random, and compare the average of the London samples with the other two for each month.

COMPARATIVE ANALYSIS IN PARTS PER 100,000

	LONDON		<i>Birmingham</i>		<i>Glasgow</i>	
	Organic Carbon	Organic Nitrogen	Organic Carbon	Organic Nitrogen	Organic Carbon	Organic Nitrogen
June . .	·107	·014	·260	·050	·126	·011
July . .	·091	·012	·180	·050	·128	·011
August .	·084	·012	·120	·030	·175	·011

The comparison, so far as it goes, is distinctly favourable to London; and though there may be purer supplies than Glasgow and Birmingham, there are no such model municipalities; at least, so we are given to understand.

A method of comparison more commonly relied upon by scientific observers and by water engineers is to take the relative death-rates from typhoid fever. The following table, compiled in the Registrar-General's office, shows the mean annual death-rates from this cause in London and the twelve next largest towns for the twenty years 1871-1890:

LONDON	21·4	Bristol	23·6
Liverpool	26·7	Hull	34·6
Manchester	30·1	Nottingham	40·5
Birmingham	25·4	Salford	40·1
Leeds	36·7	Leicester	29·1
Sheffield	31·6	Newcastle	28·5
Bradford	29·7		

For the period of twenty years, therefore, London comes out easily first.

A further table prepared by the Medical Officer of Health to the London County Council shows some comparative typhoid rates for the ten years, 1881-90 only :

LONDON	19	Hull	25
Portsmouth	49	Liverpool	26
Blackburn	41	Birkenhead	21
Preston	38	Brighton	18
Nottingham	29	Bradford	17
Cardiff	28	Bristol	15
Derby	26	Huddersfield	15

Out of the thirteen towns here enumerated, including several not given in the previous list, only four come out better than London. Among them are Bradford and Bristol, which are to be congratulated on having effected a great improvement on the previous decade. In 1895 we find, from another return, that London had further improved, and still maintained a marked superiority over the four next largest towns :

LONDON	14	Leeds	21
Liverpool	37	Birmingham	17
Manchester and Salford .	30		

Taking diarrhœa, which is also to some extent affected by water supply, we find the following rates prepared by the medical officer to the London County Council in order to compare London with the other English towns having a population of over 200 :

DIARRHŒA DEATH-RATES

	1884-93	1894		1884-93	1894
LONDON . .	73	42	Nottingham . .	109	60
Manchester . .	109	67	Hull . .	118	43
Liverpool . .	110	100	Salford . .	151	68
Birmingham . .	118	52	Bradford . .	88	30
Leeds . .	116	45	Bristol . .	51	31
Sheffield . .	118	56			

Only two towns out of the ten—namely, Bradford and Bristol—have the advantage over London in 1894, and only one—Bristol—in the previous decade. The superiority of these two towns in respect of diarrhœa corresponds in a very striking manner with their position in the typhoid table given above. It is interesting to note that Bristol, which comes out best of all in both tables, is supplied by a water company.

It is needless to add any more figures, and I will merely say that London's comparative freedom from water-borne disease has been fully maintained up to the present time, the last quarterly report showing an average fever rate of 15 for the great towns and only 11 for London. Nor has the vigilant and searching eye of the County Council's very able medical officer succeeded in proving any connection

between the incidence of such disease in different localities and the distribution of the water supply. In the face of all this evidence the Londoner may go to bed at home in full confidence that he could hardly find a town in the country so free from the dangers of the tap.

(3) *Cost*.—The water rates are a great and perpetual grievance. It is seldom alleged that water is actually very dear, but the consumer is encouraged to think that it is rather hard on him to be compelled to pay anything at all for one of the ‘necessaries of life,’ and he is given to understand that people elsewhere, if they do not get it quite gratuitously, are only called upon to disburse a trifling sum compared with the rates imposed by the companies. Indeed, it was a quarrel over the rates in 1883 which first gave rise to the odium that has since grown so strong. The case of *Dobbs v. The Grand Junction Company* elicited a ruling of the House of Lords that ‘annual value’ meant ‘net annual value,’ with the result that a good many water rates had to be lowered. It was a barren victory, because other rates had previously been lower than the amount authorised by law, and the raising of them neutralised the effect of Mr. Dobbs’s triumph. There was very little in it; but the belief, disseminated during the legal struggle, that the companies were in the habit of overcharging left an angry feeling behind. Let us see what the charges are. I take them from Mr. A. J. Alexander’s

tables, prepared for Parliament. It will be sufficient to give five valuations :

CHARGES PER ANNUM

Company	Rateable value														
	£10			£20			£30			£50			£100		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
New River .	0	8	0	0	16	0	1	4	0	2	10	0	5	1	0
Grand Junction															
Chelsea .															
West Middlesex .	0	7	5	0	14	10	1	2	3	2	9	11	4	13	5
Kent	0	12	0	1	4	0	1	11	0	3	8	0	5	2	0
Lambeth . . .	0	15	0	1	10	0	2	12	0	4	13	0	7	2	6
East London .	0	10	0	1	0	0	1	10	0	3	2	0	7	7	6
Southwark and Vauxhall	0	10	0	1	0	0	1	10	0	3	0	0	6	1	0
Average . . .	0	9	9	0	19	7	1	9	8	3	0	4	5	13	8

The discrepancy between the Lambeth and the other companies is very noticeable, and a distinct grievance to the inhabitants of that part of London. If rates were equalised they would benefit by the change, but of course the other districts would pay for it. Compared with other towns, however, even the Lambeth people have no very substantial cause of complaint, as the table which follows will show. On this head it is to be observed that there is great difficulty in comparing one town with another, because the rates are levied on totally different principles, suited to the local requirements. To take the domestic water rates alone for towns like Liverpool and Manchester, and compare them with

London, is merely misleading, because in those towns water is also paid for by a general rate on all property and by special trade rates in addition. The true comparison requires a complicated calculation. This has been worked out for a number of towns by Dr. Pole, Mr. Askwith, and Mr. Alexander. Their tables are not quite up to date, as some slight changes have occurred since they were compiled, but they are substantially accurate, and they constitute the only trustworthy statement of the case available.

CHARGES PER ANNUM

Town	Rateable value														
	£10			£20			£30			£50			£100		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Liverpool . .	0	13	6	1	5	11	1	17	2	3	0	9	5	0	0
Manchester . .	0	11	0	1	1	0	1	11	0	2	10	0	5	0	0
Salford . .	0	9	9	0	18	9	1	7	9	3	16	0	6	1	0
Birkenhead . .	0	10	8	1	0	8	1	9	8	2	8	8	4	17	2
Brighton . .	0	7	6	0	15	0	1	2	6	1	16	0	3	12	0
Birmingham . .	0	10	0	1	10	0	2	10	0	3	5	0	6	0	0
Blackburn . .	0	16	0	1	12	0	2	8	0	3	16	9	7	13	7
Bolton . .	1	1	8	1	13	0	2	2	0	3	14	0	5	14	0
Bristol . .	1	5	8	2	0	0	3	9	8	4	7	0	6	11	0
Derby . .	1	0	0	1	12	0	2	0	0	3	13	0	5	12	0
Oldham . .	0	19	6	1	16	6	2	12	1	4	0	0	7	2	0
Stockton . .	1	1	0	1	15	0	2	7	0	4	4	0	7	4	0
Newcastle . .	1	0	0	1	13	0	2	0	0	3	1	0	4	8	0
Average . .	0	15	10	1	8	8	2	1	3	3	7	10	5	10	2

When the average of these thirteen towns is compared with the average of the London companies, the one striking fact which stands out is the great advantage enjoyed by the poorer consumers in London.

The highest charge in London on the 10*l.* valuation—that of the Lambeth Company—is appreciably lower than the provincial average, and the London average is no less than 40 per cent. lower. On the 20*l.* valuation it is 32 per cent. lower; on the 30*l.* valuation it is 26 per cent., and on the 50*l.* valuation 11 per cent. lower; only when we come to premises rated at 100*l.* and upwards are the London charges higher than the provincial average. In other words, by the system of graduated water rates imposed by the London companies the rich pay for the poor. This is notably the case with the two companies who supply the great areas of poverty, namely, the East London and the Southwark and Vauxhall. In fact these two companies—and especially the East London—supply their poorest customers at a loss which is made good by higher charges on the more heavily rated houses. Under a municipal authority the rates would necessarily be equalised, and the poor would have to forego the advantage they now enjoy. This fact, which is studiously kept out of sight by Progressive politicians, is worth the attention of the poorer classes, in whose interest municipalisation is ostensibly advocated.

Apart from this it is clear that the alleged superior cheapness of provincial water is as baseless as its alleged superiority in quantity and quality. Brighton is the only town in the list which has a distinct advantage over all the London companies.

The Brighton water, indeed, comes out top in every respect: it is very cheap, very good, and very copious. That is the advantage of being situated immediately under the great chalk downs, which form an enormous natural reservoir. In Liverpool, Manchester, and Birmingham, water is generally dearer than in London, and if the difference in quantity per head is taken into consideration, it is considerably dearer. Another way of looking at the question is to take the income per 1,000 gallons earned by the water authority. We hear a great deal about the enormous profits of the London companies. It is, therefore, interesting to note that their average income per 1,000 gallons in 1897 was 7*d.*, whereas the income of various provincial water authorities is returned by Mr. Alexander as follows, in pence per 1,000 gallons: Liverpool 8·3, Manchester 7, Sheffield 9·6, Birmingham 5·9, Bristol 9, Brighton 8·3, Huddersfield 9·5, Birkenhead 8·1, Oldham 7·8, Derby 7·5.

I have now discussed the three questions of quantity, quality, and cost, and have shown by indisputable facts that the current belief in the inferiority of the London supply is a complete delusion. It is possible to pick out this town or that as having an advantage in one or other respect; Bristol water is good, Hull water copious, Glasgow water copious and cheap, and so on. But then Bristol water is scanty and dear; Glasgow and Hull water of inferior

quality. Taking every point into consideration, I cannot find any provincial town of first-rate importance which has a supply so good all round as London, and most of them are distinctly inferior in every single respect.

But, it will be said, the London companies are always breaking down; they may pump the water, but it does not reach the consumers; there is always frost or drought or some other excuse for not fulfilling their obligations. Well, there was the general breakdown from frost in 1895, when a good many mains were frozen, and there were the East London 'water famines' from drought in 1895, 1896, and 1898. That, I believe, is all, except one failure on the part of the Southwark Company in 1873, when the constant supply was being introduced before the necessary works had been completed. I shall have more to say about these occurrences later on, and do not intend to discuss them now; but meantime what about other towns, which is the present point? It is assumed in London, whenever anything happens to the water supply, that such things do not occur elsewhere simply because Londoners do not hear of them. As a matter of fact, they have occurred much oftener in other places—in Liverpool, Manchester, Sheffield, Bradford, and other large towns. Manchester broke down in 1874, 1884, 1887, 1888, 1893, and 1897; Liverpool in 1892, 1893, 1894, and 1895; Bradford in 1876, 1877, 1878, 1879, 1880, 1883, 1884, and 1898.

In the drought of 1868, Manchester, Sheffield, Bradford, Halifax, Newcastle, Preston, Bury, Oldham, and many other towns suffered, but London did not. Similarly in 1888 Manchester, Liverpool, Oldham, Bolton, Halifax, Sheffield and others were in difficulties of which London knew nothing. As for the frost in 1895, it affected the whole country. Moreover, the municipal authorities were much less energetic than the water companies in coping with the difficulty by sending round water carts, and executing repairs as rapidly as possible. The drought of 1898, again, caused a breakdown in a large number of places all over the country. Croydon is an instructive example, because that town is in part supplied by the Lambeth Company. The municipal water supply broke down, but the company did not. During the last twenty-five years the eight London companies have only broken down three times between them, while the eight next largest towns have done so at least thirty times.

Lastly, there is the grievance that the companies possess such inequitable and oppressive powers. Tremendous capital is made out of the fact that they are protected by their 'special Acts of Parliament,' and that whether they break down or not, they continue to levy their rates and distribute their dividends all the same. During the last occasion—the East London 'water famine' of 1898—popular indignation mainly rested on this monstrous injustice. I am not

concerned to defend the position, though I suppose it means at bottom that no one can undertake to provide a constant supply of water on any other terms. For all water authorities—and this is the point—possess just the same powers and act in just the same way. The notion that the London companies possess special protection is a pure delusion. To prevent any doubt on the subject I will quote the Acts. That relating to the companies is the Metropolis Water Act of 1871. It is not a private Act obtained by the companies for their own protection, as we are so often told, but a public statute imposed on them by Parliament for their regulation and control. Section 15 runs as follows :

Notwithstanding anything in this Act a company shall not be subject to any liability for not giving a constant supply if the want of such supply arises from frost, unusual drought, or other unavoidable cause or accident.

It is merely a recital of the protection afforded to all water authorities, private or public, by the Waterworks Clauses Act of 1847, which contains this proviso—section 36 :

Provided always that the undertakers shall not be liable to any penalty for not supplying water if the want of such supply shall arise from frost, unusual drought, or other unavoidable cause or accident.

When municipal supplies break down, as I have shown they constantly do, consumers get no more

redress than East Londoners. They have to pay their full rates all the same, and if any expense has been incurred they have to pay for that too. Thus they not only put up with the inconvenience, but are positively fined for doing so. Under a municipal authority, East London in the frost of 1895 would have been obliged to pay 40,000*l.* for going without their proper supply for weeks.

The belief that the water companies possess specially oppressive powers and are guilty of 'high-handed' conduct in cutting off water is equally unfounded. All water authorities have the same power to cut off the supply for non-payment of rates, and municipalities exercise it in a much more peremptory fashion than private companies, because they have every inducement to collect the money, and none to avoid offending consumers or exciting odium. For the prevention of waste they generally possess more oppressive powers than any London company, and this accounts for their ability to keep down consumption to the low point I have previously indicated. For instance, the Manchester regulations contain the following provision: 'All taps and other water fittings must be tested and stamped by the proper officer of the corporation.' This regulation has been almost universally adopted by municipal authorities, but when the East London Company tried to obtain its insertion in their Bill of 1893 they were compelled to withdraw it. Many

towns again, including Manchester, Nottingham, Leicester, Oldham, and Huddersfield, insist upon the employment of standard workmen, as well as standard fittings, and forbid free plumbing altogether. They order repairs and renewals up to the prescribed standard and at the owner's expense, to be executed within twenty-four hours, and in default they cut the water off next morning. In Leeds last summer public notices were posted peremptorily forbidding the use of water for cleaning windows, washing doorsteps, watering flowers, &c. under a penalty of 5*l*. Yet when the East London Company sent out notices requesting people not to use garden hoses, a howl of indignation was raised at their oppressive and high-handed action.

In truth Londoners have been befooled from beginning to end with regard to the supposed advantages enjoyed elsewhere. I do not say the London water supply might not be improved; I do not say that a change in the system might not improve it; but I do say on the evidence of facts which cannot be gainsaid that, even as things stand, Londoners are much better off than the inhabitants of the other large towns which enjoy a municipal supply. I am personally acquainted with the water supplies in Paris, Berlin, Vienna and St. Petersburg; they are all inferior. In fact, I can only find one town which has a better supply all round, and that is Brighton.

CHAPTER VI

THE FUTURE SUPPLY AND THE BALFOUR
COMMISSION

ABOUT thirty years ago various large schemes for supplying London with any quantity of water were talked about; but the Royal Commission, presided over by the Duke of Richmond in 1867-69, set them aside, and from that time onwards until lately the matter has been left to the companies, who have gone to Parliament as occasion required for powers to increase their supply. It may be a haphazard way of carrying on, but the proof of the pudding is in the eating, and after all it worked perfectly well until the advent of the London County Council. The companies always managed to find the water and to keep up with the needs of the growing population, which increased, by-the-bye, very much more rapidly between 1871 and 1881 than it has done since or is ever likely to do again. And when you come to think of it, there were very good reasons why it should be so. The companies are under statutory obligations to provide water for all who want it within their districts; they are subject to

heavy penalties for failing to do so under normal conditions; they are looked after by the Local Government Board; and lastly, having been a long time in the business, they understand it very well. Like other sound business people, they have not gone in for any grand and far-reaching but precarious schemes; they have contented themselves with the steady conduct of the water supply as a going concern. Nor is there any reason to suppose that they could not have gone on doing so indefinitely.

With the appearance of the London County Council on the scene in 1889 a change occurred which has greatly affected the situation. I shall deal more fully with the proceedings of the Council in a subsequent chapter; for the present it is only necessary to observe that, among other things, they immediately reopened the question of 'new and better' sources of supply. After some inquiries and other proceedings, a letter was addressed to the Prime Minister (Lord Salisbury), under the date of December 12, 1890, requesting a Royal Commission on the subject. As the proceedings of the Commission, which was subsequently appointed in response to this request, have recently been the occasion of controversy, it may be as well to give the letter in full:

December 12, 1890.

My Lord,—The Council was authorised by an Act of last session to make an inquiry into the

subject of the London water supply, and was empowered to expend a sum of money not exceeding 5,000*l.* for this purpose.

That inquiry, which has been commenced, has already convinced the Council that there are strong *primâ facie* grounds for the belief that the Thames district will not long suffice for the needs of the rapidly growing population, and that an additional supply will soon be imperatively required.

The Council, however, has no power to call upon the water companies or other independent bodies or persons to assist in the inquiry, and any conclusions to which it comes will not necessarily be adopted, either by such bodies or by the public. The Council has therefore come to the conclusion that, in order to make such an inquiry complete and satisfactory, it is desirable that it should be undertaken under the direction and with the aid of her Majesty's Government.

The object of this letter is, therefore, to request her Majesty's Government, in accordance with the unanimous resolution of the Council, to institute an inquiry *whether the present sources of water are adequate in quantity and quality to the growing demands of the population, and whether any, and if any, what steps should be taken to provide a better supply.*

I am to add that, under the circumstances, the Council is anxious that no time should be lost, and has therefore expressed a hope that the inquiry which the Government is asked to institute may result in the presentation of a report before the close of the present session.

I send for your information a copy of a memorandum laid before the Council by the Vice-Chairman, Sir Thomas Farrer, and of a report by the chief engineer of the Council, both of which contain state-

ments and reasons which it is believed will be found on perusal to justify the course which the Council asks the Government to take.

Should your Lordship be of opinion that a conference with a few of the members of the Council would assist you in forming a judgment on the matter submitted to you, I need hardly say that some of us would be happy to wait upon you.

I have, &c.

(Signed) JOHN LUBBOCK,
Chairman of the Council.

The Most Honourable the Marquis of Salisbury.

The italics are mine; they show exactly what the Council asked for. The Government apparently did not agree that the matter was very urgent, and the Commission was only appointed in March 1892. It consisted of Lord Balfour of Burleigh (chairman), Sir George B. Bruce (engineer), Sir A. Geikie (Professor of Geology in Edinburgh University), Mr. James Dewar (Professor of Natural Philosophy in Cambridge University), Mr. G. H. Hill (engineer), Mr. J. Mansergh (engineer), and W. Ogle, M.D. A stronger body of experts could not be suggested. Mr. G. H. Hill, it may be noted, constructed the Manchester and Glasgow works, and Mr. Mansergh is the chief engineer for the Birmingham works now in progress. Both enjoy the highest reputation as consulting hydraulic engineers, and it may be said, without fear of contradiction, that there are no

greater authorities on the subject living. The Commissioners subsequently appointed Mr. R. E. Middleton, M.Inst.C.E., an assistant Commissioner, for the purpose of making independent investigations into doubtful questions raised in the course of the inquiry. The terms of reference were as follows. The Commission was commanded to ascertain :

Whether, taking into consideration the growth of the population of the metropolis and the districts within the limits of the Metropolitan water companies, and also the needs of the localities not supplied by any Metropolitan company, but within the watersheds of the Thames and the Lea, the present sources of supply of these companies are adequate in quantity and quality, and, if inadequate, whether such supply as may be required can be obtained within the watersheds referred to, having due regard to the claims of the districts outside the metropolis, but within those watersheds, or will have to be obtained outside the watersheds of the Thames and Lea.

The Commission has recently been blamed for not inquiring into the County Council's Welsh scheme, but it was not asked to do so. Then the Government has been blamed for 'excluding' the Welsh scheme from the terms of reference, but the Government was not asked to include it. The inquiry was exactly what the County Council had asked for; they had never said a word about Wales. In point of fact, the Welsh scheme was not then in existence in any definite shape; it has been developed

since. The attitude of the Council at that time was very different from that which it has since adopted. With a view to assisting the Royal Commission, the Council's officers had been instructed to prepare reports and evidence on the subject, but the Council expressly disclaimed any intention to prejudge the question. According to the statement laid before the Royal Commissioners by Mr. W. H. Dickinson, Chairman of the Council's Water Committee, they did not possess sufficient information to justify the adoption of any particular policy; but they made certain suggestions with regard to the scope of the inquiry. The following quotations from Mr. Dickinson's statement shows the precise position then taken up by the Council:

The Committee (*i.e.* the Water Committee of the County Council), have considered the above-mentioned reports (by the Council's officers), and in some instances have had them circulated to the Council, but these reports, without further information, are clearly not sufficient to enable the Council to form a judgment upon the various questions connected with the future water supply of London, and therefore the Council is anxious to avoid taking up any definite position in favour of or antagonistic to the present methods of supply.

It is thought that it would be premature and undesirable for the Council (on the limited information at present available) to attempt in any way to prejudge the questions upon which the Royal Commission are inquiring, but the Commission having expressed a wish to be furnished with some indica-

tion of the views of the Council on the subject of the inquiry, a memorandum was prepared by the Deputy Chairman of the Council, embodying the observations appearing below, and, having been carefully considered and discussed by the Water Committee and the Council, the following resolutions were formally adopted, viz :

‘1. That in making any estimates having reference to the future water supply of London, such estimates should be based on a period of fifty years from the present time.

‘2. That in dealing with the question of a source or sources of water which shall meet the requirements of London and its neighbourhood for fifty years, provision should be made for supplying a population of at least 12,500,000.

‘3. That in calculating the quantity of water required per head per day, the amount at present supplied by the companies should be increased by at least 10 per cent., and in no case should it be less than thirty-five gallons.’ (*Report*, vol. ii. p. 211.)

Here we have a clear statement made by the Council that they were requested to indicate their views, and that in reply they contented themselves with laying down conditions for a very extensive forecast into the future. Those conditions go far beyond anything contained in the terms of reference, which only speak of ‘the growth of the population,’ or in the County Council’s original letter, which expresses the belief that ‘the Thames district will not long suffice for the needs of the rapidly growing population.’ The Commissioners, however, adopted the suggestions of the Council, with the modification

of taking 40 years instead of 50. Ever since then the distant future has been set up as a fetish, to the neglect of the present and the immediate future. We have perpetually impressed on us the extreme urgency of providing water against the time when most of us will be dead; but when the question is of next year, or the year after or a few years hence, for which the engineers who are actually responsible for supplying water desire to provide, then they are opposed tooth and nail on the ground that there is no urgency at all, and no need for doing anything, by the very people who are so anxious about the remote future—a singular state of things, resulting in ‘water famines,’ which never used to occur, although the population, as I have said before, increased at a much greater rate than it is increasing now, according to the last two censuses of 1891 and 1896. It seems to me that less anxiety about the distant and more about the immediate future would better serve the public interest.

However, to return to the Balfour Commission and its forecast of the future. The Commissioners did their work most thoroughly. They sat on 45 days, and took the evidence of 92 witnesses, all of an official or scientific character. It is worth while to give their own account of the evidence, which was divided into two parts—

We took, first, the evidence of the Metropolitan water companies as to the quantity of water which

they were daily supplying per head of the population, the sources at their command to meet that supply at the present time, and the grounds upon which in their opinion future demands ought to be based; secondly, the evidence of the officers of the Conservators of the rivers Thames and Lea as to the powers of the water companies to abstract water from those rivers, and the measures taken to prevent their pollution; thirdly, the evidence of officials in the employment of the London County Council, and of persons who had made investigations under the directions of the Council as to the amount of rainfall in the valleys of the Thames and Lea, the existing pollutions of those rivers, and the probable future requirements of the Metropolitan area; fourthly, evidence prepared at the General Register Office as to the populations of the areas affected by our inquiry; fifthly, evidence offered by Councils of counties and by Corporations and Local Boards within the watersheds. . . . The second division of the evidence included the general evidence of engineers, geologists, chemists and bacteriologists, bearing upon the subject as a whole.

It must be admitted that the inquiry was comprehensive enough. In point of fact, everybody who could throw any light upon the subject was examined, and every opportunity was afforded for the enunciation of conflicting views. The water companies, it may be observed, were only called on to state their existing supply, the sources from which it was obtained, and their views as to future requirements. Of the adequacy of their sources to meet such requirements the Commissioners were

themselves to judge, and they based their conclusions upon the evidence of other witnesses altogether. They had before them the records of the flow of the Thames and the Lea put in by the Conservators of those rivers; they had the rainfall put in by Mr. G. J. Symons, F.R.S., and other meteorologists; they had the views of eminent engineers and geologists—including Sir Frederick Bramwell, Mr. T. Hawksley, Mr. Deacon, Sir John Evans, Professor Boyd-Dawkins, and Mr. W. Whitaker, F.R.S.—on the quantity of water available from the rivers and from the chalk. Upon the question of quality, evidence was given by Sir W. Crookes, Professor Odling, Professor Ray Lankester, Dr. Klein, Dr. Sims Woodhead, Sir E. Frankland, and others.

The companies estimated the population supplied by them in 1891 at 5,490,791, and the gross amount of water pumped at 182,456,905 gallons per diem. For engineering reasons the Commissioners reduced this to a net supply of 171,163,385 gallons, which works out at 31·19 gallons per head. In speaking of the estimates put forward by ‘the companies,’ it should be remembered that they did not offer any combined estimates; the figures are obtained by adding together those furnished by each company on its own account. Their forecasts of requirements in 1931—that is forty years ahead—were as follows:

—	Population	Supply per head	Supply required
		gallons	gallons
East London	1,691,000	33·0	56,000,000
New River	1,658,000	28·5	47,250,000
Southwark and Vauxhall . .	1,215,457	25·0	30,386,425
Lambeth	1,136,141	25·0	28,411,025
West Middlesex	959,187	28·0	26,857,236
Kent	900,000	30·0	27,000,000
Grand Junction	584,969	42·0	24,500,000
Chelsea	375,000	35·0	13,125,000
Totals	8,526,054	29·73	253,529,686

To meet these requirements the estimated capability of supply in 1931 was given as shown in table on next page.

In addition to the above sources it was pointed out, on behalf of the companies, that the supply from the Thames and Lea might be largely increased by the construction of reservoirs for the storage of surplus water, and Messrs. Hunter and Fraser brought forward a scheme for building such reservoirs at Staines by which the amount abstracted daily from the river might be raised to 300 million gallons.

The foregoing calculations as to future requirements were not accepted by the Commissioners, who estimated the population in 1931 at about $11\frac{1}{4}$ millions, and the supply per head at thirty-five gallons, bringing the required total supply up to 391,717,690 gallons per diem. Adding 6 per cent. for exceptional seasons, they arrived at a maximum of 415,219,752 gallons.

	Gallons	Gallons
EAST LONDON		
River Lea <i>with storage reservoirs</i>	30,000,000	
Authorised take from Thames	10,000,000	
Gravel beds at Hanworth	2,000,000	
Existing wells in Lea Valley	11,000,000	
Further wells in ditto	13,000,000	
		66,000,000
NEW RIVER		
Authorised take from Lea	22,500,000	
Chadwell spring and wells	34,000,000	
		56,500,000
SOUTHWARK AND VAUXHALL		
Authorised take from Thames	24,500,000	
Gravel beds at Hampton	3,000,000	
Existing well	3,000,000	
Seven proposed wells	10,500,000	
		41,000,000
LAMBETH		
Authorised take from Thames	24,500,000	
Gravel beds	6,000,000	
		30,500,000
WEST MIDDLESEX		
Authorised take from Thames	24,500,000	
Thames, wells or gravel beds	2,357,236	
		26,857,236
KENT		
Wells in present lands		29,000,000
GRAND JUNCTION		
Authorised take from Thames		24,500,000
CHELSEA		
Authorised take from Thames		22,000,000
	Total	296,357,236

NOTE.—The italics indicate sources for the utilisation of which new works or new powers were required.

With regard to the population, it is to be noted that whereas the water companies were only dealing with the 514½ square miles over which they supply water, the Commissioners took the whole of

'Greater London' and an outside fringe as well, making a total of 845 square miles. They arrived at the future population of this area by supposing the increase to proceed at the same rate as between 1881 and 1891. No one can say whether they were right or not, but the probabilities are very much against it. We know, in fact, that during the next five years that rate was not maintained, and its tendency is continually to decrease. Six years have now elapsed since the calculation was made, and the population supplied by the companies has only increased by 511,304. If that rate of increase were maintained the population in 1933 would be just 8,716,190, which is a curious corroboration of the company's estimate of 8,526,054 for 1931. It seems probable that in reckoning for 12 million we are preparing for a population which will never arrive. At the same rate London would contain 24 million in 1971, which is absurd. Physical possibilities must be taken into account, and already there is not sufficient room for the present inhabitants to get about and do their business, while the suburban railways are in a chronic state of failure to carry the traffic. It is impossible to conceive the suburban population doubled or more than doubled, as it would be, under the Commissioners' estimate.

On the other hand, their estimate of the supply required per head has been fully justified by subsequent experience, and it is clear that the companies

were out of their reckoning when they set it down as less than thirty gallons. At any rate, they have signally failed to bring it so low as that up to now. They have not even brought it down to the thirty-five gallons suggested by the County Council and accepted by the Commissioners. This makes such an immense difference in the aggregate requirements that it is worth examining a little more closely. If the forecast made for the Balfour Commission is compared with the actual figures for 1897, it will be seen that the discrepancy is much greater with some companies than with others.

Company	Estimate 1891	Actual 1897	Difference
East London	33·00	32·47	- 0·53
New River	28·50	30·58	+ 2·08
Southwark and Vauxhall	25·00	41·72	+ 16·72
Lambeth	25·00	35·52	+ 10·52
West Middlesex	28·00	33·81	+ 5·81
Kent	30·00	30·22	+ 0·22
Grand Junction	42·00	49·03	+ 7·03
Chelsea	35·00	44·35	+ 9·35

These companies made little or no mistake—the East London, which is indeed half a gallon better than its word; the Kent, which is almost exactly right; and the New River, which is only two gallons wrong. The others are all, more or less, seriously out of their reckoning, especially the Chelsea, the Lambeth and the Southwark, with 9, 10½, and 16½ gallons in excess of their estimates respectively.

Now the consumption per head depends partly on the character of the neighbourhood supplied; for instance, the two West End companies—the Chelsea and the Grand Junction—supply a great deal more than any of the others, and especially the latter, which has all Mayfair and most of the West End clubs on its list. Poor neighbourhoods use much less; but as the general standard of living rises and conveniences multiply—such as private bath-rooms, public baths, lavatories, washhouses, and so on, the consumption of water tends to increase everywhere. It is probable that this factor, which has come into marked prominence in London during the last few years, accounts in some measure for the miscalculations noted above. But consumption under the constant supply depends more upon the prevention or non-prevention of waste than upon anything else; and it was here that the companies were mainly mistaken. At that time the East London alone had experience of the constant supply over the whole of its area, and the engineer expressly stated that he had no hopes of reducing consumption below thirty-three gallons per head, because of the enormous waste and the difficulty of preventing it. The East London was the pioneer in this matter; it had a much longer and larger experience than the rest, as 98 per cent. of its supplies were already constant in 1891, while the other companies ranged from 24 per cent. to 77 per cent. They have all extended

the constant supply since then—the Chelsea, from 24 to 99 per cent.; the Grand Junction, from 75 to 100 per cent.; the West Middlesex, from 43 to 88 per cent.; the Kent, from 58 to 92 per cent.; the New River, from 45 to 88 per cent.; the Lambeth, from 53 to 66 per cent.; and the Southwark, from 77 to 94 per cent. And this goes far to explain why the average consumption per head has increased from 32·68 to 35·42 gallons, instead of diminishing. The hopes of diminishing it to 29·73 gallons were based on insufficient experience.

Waste, it may be explained, takes place in three ways—through defective fittings, carelessness in leaving taps running, deliberate misuse by letting water run continuously. It is mainly a matter of ignorance, due to the notion that water is a free gift of Nature, like air, and that it is, or ought to be, inexhaustible. Under the constant system an unlimited rise in consumption is always found to take place, unless stringent efforts are made to check waste, and accordingly the law provides means for preventing it. Water authorities have power to make regulations as to fittings—are, indeed, compelled to do so—and to prosecute for wanton misuse. But the mere inspection of houses is found to be almost useless. It is necessary to detect the actual source of waste and the precise premises in which it is going on. This is affected by means of meters, known as Deacon's detective meters, placed in the

mains, and furnished with an automatic arrangement, which records the amount of water passing continuously. If water is shown by any meter to be running during the night or in excessive quantities at other times, it is certain that waste is going on in the district commanded by that meter, and then the exact seat of it is located by stethoscoping. At this point the difficulty begins. To deal effectually with the evil the water authority ought to be able to insist on the use of standard fittings, where leakage is the cause, and to bring the law to bear on cases of carelessness and wanton misuse. The London companies are handicapped in both respects. They have not the power, possessed by most municipal authorities, of enforcing the use of standard fittings and standard plumbing; and prosecutions for wilful waste are generally money thrown away, owing to the difficulty of obtaining convictions and the smallness of the fines inflicted in the Metropolitan police courts. Consequently action is generally limited in practice to the serving of notices, which the people soon learn to ignore, and the task is for ever beginning over again. Fittings are put right after the usual style of London plumbing, which leaves them worse than ever a month or two later, while the habitual wasters of water, after a brief spasm of reform, speedily resume their former habits.

This explains why certain companies were deceived by a limited experience of waste prevention

into thinking that they could reduce consumption to something like the real requirements. They had also the deceptive example of the large provincial towns before them, and the opinion of several eminent engineers of large experience. But it is pretty clear that the engineer of the County Council was right when he said that as fast as you reduce consumption by checking waste it tends to rise again immediately.

I have gone somewhat out of my way to discuss this question at length, because it has an important bearing on water supply in general, and on the future needs of London. The upshot is that the companies, as a whole, were wrong in their estimates, and the Commissioners were right ; nor is there much ground for hoping that any substantial reduction will be effected by the companies unless they are given power to test and stamp fittings, and are better supported by the authorities in their efforts to prevent waste. In this connection it is perhaps worth noting that the County Council's engineer, in an interview published on November 17, 1898, is reported to have given as one reason for advocating public control of the water supply, that a public authority 'can enforce much more stringent regulations than a company can for the prevention of waste.' And yet when the East London Company endeavoured in 1893 to obtain power to test and stamp fittings, as is done by municipal authorities, they were opposed by the County Council, and had to withdraw the clause.

This illustrates the position in which the companies are placed, and helps to explain their failure to reduce consumption under the constant system so low as they anticipated.

We come back to the Balfour Commission and its findings with respect to the future requirements of London. They amount to an acceptance of the conditions laid down by the County Council, namely, that provision should be made for supplying a population of about 12 millions at not less than thirty-five gallons per head, making a total supply of 420 millions. This quantity the Commissioners found could be obtained from the existing sources as follows:—

From the Thames	300,000,000	gallons
From the Lea	52,500,000	„
From wells in the Lea Valley	40,000,000	„
From wells in Kent	27,500,000	„
Total	420,000,000	„

To obtain the stated amount from the Thames and the Lea additional storage was, in their opinion, required in both cases. With regard to the Thames, they found that the average daily flow down to the intakes of the waterworks was ‘during a long series of years’ 1,350 million gallons; during three consecutive dry years 1,120 millions, and in the driest year 900 millions.

These being the facts, we are of opinion that by the construction in the neighbourhood of Staines of

reservoirs of adequate capacity into which water shall be pumped and stored in times of excess, to be used in times of deficiency, at least 300 million gallons a day may be obtained for the supply of London. We believe that this can be done without taking in the more turbid of the flood waters, and without injuriously diminishing the volume of the river below the point of abstraction.

With regard to the Lea, they found that from the drainage area above Feilde's Weir 'on the average of three consecutive dry years 81 million gallons a day will flow off by the river.' Adding the area below, they say 'We shall probably be safe in calling the total available quantity 85 million gallons.' Of this the New River drew $22\frac{1}{2}$ million gallons, while the East London reckoned on 30 millions in their estimate (p. 86), but sometimes drew as much as 37 millions.

Dealing with the river as a whole, this abstraction is, in our opinion, too great with the storage now in existence, but if other reservoirs were constructed, adequately increasing the storage capacity on well recognised lines, the taking of $52\frac{1}{2}$ million gallons a day may be continued.

They were further of opinion that a considerable quantity of water, in addition to the 420 million gallons, was procurable from the chalk area in the valley of the Medway and further east, outside the Kent Company's district.

With regard to the quality of the water, their finding was as follows :

We are strongly of opinion that the water, as supplied to the consumer in London, is of a very high standard of excellence and purity, and that it is suitable in quality for all household purposes. We are well aware that a certain prejudice exists against the use of drinking water derived from the Thames and the Lea, because these rivers are liable to pollution, however perfect the subsequent purification, either by natural or artificial means, may be; but having regard to the experience of London during the last thirty years, and to the evidence given to us on the subject, we do not believe that any danger exists of the spread of disease by the use of this water, provided that there is adequate storage and that the water is efficiently filtered before delivery to the consumers.

Since that pronouncement considerable improvement in the quality of the raw Thames water has been effected by the active measures for the prevention of pollution taken by the Conservators under the Conservancy Act of 1894, which gave them control of the whole river and its tributaries down to the remotest sources. That work is still in progress, and there is every reason to believe that so far from deteriorating, the river is becoming less polluted, in spite of the increase of population along its course.

CHAPTER VII

THE CASE OF EAST LONDON

So far as the general public and the Legislature were concerned, the result of the Balfour Commission, which reported in 1893, was, broadly, to settle the question of future requirements, raised by the County Council, in favour of the existing sources of supply; and it would doubtless have remained settled for a long time to come but for a series of failures to maintain the constant supply in East London. These occurrences culminated in the year 1898 in such a fashion as to give the County Council an opportunity of re-opening the whole question, and once more pressing its claims to be constituted the water authority for London and the suburbs, on the ground of the inadequacy of the present supply. It is, therefore, necessary to examine the facts somewhat closely, and, as they involve reference to evidence laid before the Royal Commission, it will be convenient to take them here, though the logical sequence of ideas might be better preserved by postponing this branch of the subject to a little later.

There have been three separate occasions of scarcity in East London since the Commission reported—namely, in 1895, 1896 and 1898. In order to swell the charge against the East London Company, the frost at the beginning of 1895 has been commonly added as a fourth occasion, but however great the inconvenience caused to consumers by frozen and burst pipes in that frost, there was no scarcity of water. On the contrary, the Company was fully equal to supplying the enormous quantity required to maintain the constant service under such abnormal conditions. Moreover, as I have pointed out before, the same state of things prevailed everywhere else all over the country, and it was in no respect peculiar to East London. To represent the occurrence, therefore, as a proof of the special inability of the East London Company to provide sufficient water may be within the bounds of political controversy—if there are any bounds—but it should be understood as a mere controversial dodge, having no relation to the truth. The frost, or rather its after effects, had something to do with the real failure of supply which occurred in the summer of the same year, but there were not two failures. Nor had there been any previously. Until 1895 the East London Company had always fulfilled its obligations, a fact of no little significance when the causes of the breakdown are investigated.

The facts of the scarcity are as follows:—On

June 28 the constant service was interrupted, and the supply shut off for nine hours at night; on July 13 it was cut down to three hours a day; on July 28 increased to six hours a day; on August 17 further increased to eleven hours; on September 8 constant service restored. The total period of interruption was ten weeks, and the period of distress to consumers about five weeks. There is no question but that the failure of the constant service causes extreme inconvenience among the poorer classes in the East of London. They have for years been accustomed to go to the tap for water whenever they want it, by day or by night, and they have come to look upon that convenience as a natural dispensation of Providence. They are consequently quite unprepared for a state of things which is normal in more primitive communities, where people are in the habit of drawing water in a pail from time to time, and keeping it by them for use between whiles. The inconvenience of an intermittent supply may be completely avoided by the use of domestic cisterns. In point of fact, some 80,000 houses in London, representing a population of upwards of half a million, still have nothing else but an intermittent supply, but the occupiers are quite unaware of it, and suffer no inconvenience, because they are provided with cisterns. In East London, however, the cisterns, which used to be universal, were done away with in the poorer class of house when the constant supply

was introduced. This was done for sanitary reasons, because the old means of storage—being mostly wooden receptacles and uncovered—were in a very objectionable condition. But it is a mistake to suppose that the water company encouraged this step. On the contrary, they always protested most strongly against it on the ground that it is impossible to ensure a constant supply in all circumstances, as the sanitary authorities seemed to suppose. In all better classes of houses, and even in the poorer ones elsewhere, cisterns have been retained. Their wholesale abolition in East London was a very great mistake. The proper thing to do with bad cisterns is to replace them by good ones, but it would have been better to have the old ones than none at all, if only to store water for flushing purposes. The contention sometimes put forward that it is impossible to combine the retention of cisterns with the system of obtaining water direct from the main is simply unintelligible, in view of the fact that this is exactly what is done in all decent houses, and generally in new ones built for the labouring classes outside London.

However, the fact remains that in East London the people have been deprived of this convenience, and were therefore reduced under the intermittent supply to something approaching the condition of the ordinary cottager, which was to them an undeniable hardship. Hence very naturally a loud

outcry arose, and great blame was laid upon the company. It is, happily, not necessary to argue this matter, because, as it happened, the Hackney Vestry petitioned the Local Government Board to hold an inquiry into the circumstances under the Act of 1852, which provides for such investigation to be held on the complaints of twenty householders. The inquiry was held at the Hackney Town Hall in October 1895, by Colonel Ducat, R.E., and the late Dr. F. W. Barry, senior medical inspector to the Local Government Board. It lasted five days. The Vestries and the London County Council were represented by counsel, and they called over thirty witnesses, including the engineer to the County Council, Sir A. (then Mr.) Binnie. It may be presumed, therefore, that the case against the company was very fully stated.

The report of the inspectors was dated November 11. Its upshot was a complete exoneration of the East London Company from all blame. The cause of the breakdown was thus stated :

From a consideration of the evidence that was brought before us we are of opinion that the necessity of suspending the constant supply service in the Metropolitan area comprised in the district of the East London Water Company was forced on the company by the unprecedented drought in the Lea Valley during the first six months of this year (1895), following on an unusually long and severe frost, which had caused such extensive

fractures to lead pipes that they could not be repaired fast enough to prevent exceptional waste of water. Further, that the East London Company were hampered in dealing with the above difficulties by the want of the additional storage and pumping power that their Bill of 1893 would have given them had it passed into law at that time.

We would also note that in our opinion the inconvenience experienced by consumers was much aggravated by the want of proper means of domestic storage. (*See Appendix.*)

The lead pipes referred to as not being repaired fast enough were the consumers' communication pipes, many of which remained still unrepaired in the month of June, causing an excessive consumption of water and consequent depletion of reservoirs. The want of additional storage and pumping powers that would have been given by the Bill of 1893 is an important point, to which I shall return presently, after referring to a theory put forward by Sir A. Binnie that the breakdown was due not to drought or lack of water but to its running to waste through cracked mains. This explanation was fully investigated at the inquiry and rejected by the inspectors, but it is still maintained by those who are interested in clearing the County Council from the damaging exposure involved in the conclusions previously quoted ; and possibly some people may still believe in it. The evidence on which it was based, and the only evidence, was that during the months of February,

March, April, and May the amount of water pumped was largely in excess of that supplied during the same months in the three previous years; that for those months and for June the total excess of 1895 over 1892 amounted to 1,501 million gallons, or a thirty-four days supply; and that more water was taken from the Lea during the period February to May in 1895 than in any of the three previous years. On the strength of these facts Mr. Binnie contended that there was plenty of water, but it ran to waste. No doubt it did, and from cracked mains up to the middle of April, at which date all repairs to the mains had been executed. Clearly the theory requires that the excessive consumption should have continued not only all through that summer but right on up to the present time, as no mains have been repaired since; but just the contrary has happened. When the constant service was resumed in September 1895, it was found that the consumption had returned to the normal, and it has since been reduced by some millions of gallons per diem in spite of an increase of nearly 100,000 in the population. Less water is actually required now to maintain the constant supply than before the frost occurred at all. Subsequent experience has therefore entirely corroborated the inspectors in their rejection of the theory. They pointed out that as the reservoirs were all full on May 26 the excessive consumption before that date could have no bearing on the subsequent scarcity.

The excess in the month of June they found to be due to the non-repair of consumers' pipes, which was consequently stated as a contributory cause of the failure. Lastly, they pointed out the return to the normal consumption in September, concluding thus: 'In our view these facts prove that the scarcity in July and August was not to be accounted for in the manner suggested by Mr. Binnie.'

In connection with this question of the frost and cracked mains, it is interesting to note, as an illustration of the effect produced elsewhere by the same occurrence, that whereas the increase in the normal consumption in East London for the five months, February to June, was 37, 28, 29, 21, and 18 per cent., in Bradford it was $13\frac{1}{2}$, $29\frac{1}{2}$, $19\frac{1}{2}$, 28, and 25 per cent., and in Sheffield 53, 67, 90, 67, and 40 per cent. These figures show not only that these towns were affected, but that repairs were effected there less energetically than in East London; and the same holds good of Manchester, Liverpool, Glasgow, and other places. The case of Bradford is particularly interesting, because the supply of that town was formerly in the charge of Sir A. Binnie; and as the frost did not spare his mains there, we may conclude that had he been then responsible for the London ones we should have fared no better than we did.

To go back to the want of storage and the Bill of 1893, mentioned in the report, I would remind the reader that the estimated supply of the East London

Company laid before the Balfour Commission, and given in the previous chapter, included this item :—
‘ From the Lea *with storage reservoirs* 30 million gallons ’ (p. 86). Later on (p. 95), the conclusion of the Commissioners with regard to the Lea is quoted, to the effect that ‘ this abstraction is too great with the storage now in existence, but if other reservoirs were constructed adequately increasing the storage, &c.’ This shows that the necessity for such reservoirs was already fully recognised. The intention of the company to construct them was definitely declared in their opening statement laid before the Commission. ‘ It is intended to construct further reservoirs, ninety acres of land having been recently secured for the purpose ’ (*Report*, vol. ii. p. 8). The Commissioners refer to these as the ‘ projected ’ reservoirs of the company, and lay great stress on them as an integral part of the company’s stated assets (Section 94). Again in Section 88 they say :

In addition to the storage reservoirs suggested to be made in the Thames, Mr. Bryan has laid before us a project for others in the Lea. These are to be located just above the existing reservoirs of the East London Company at Walthamstow, to extend up the valley for a distance of $4\frac{1}{2}$ miles. The company has at present storage for 740 million gallons, and proposes immediately to increase it to 1,200 millions by raising the banks of the Race Course reservoir and constructing two new reservoirs on land in its possession.

It was in order to construct this additional storage, and also to increase the pumping from wells, that the company brought forward the Bill of 1893. The necessity of increasing their resources to provide for the growing population in dry seasons had been foreseen for some time; arrangements had been made and plans prepared already in 1892. It was proposed to raise the capacity of the existing Race Course reservoir by 200 million gallons, to build two new ones holding 200 million gallons each, and to increase the yield from the wells by three million gallons a day. That was the object of the Bill of 1893. Had it passed, the first instalment of 200 million gallons, and the additional pumping, would have been available in 1895. This is what the inspectors of the Local Government Board say :

Our inspection of the works of the company, commenced since the passing of their Act in 1894, satisfied us that Mr. Bryan was justified in his statement that the enlargement of the capacity of the Race Course reservoir, giving 200 million gallons more storage, and the provision of additional pumping power capable of raising three million gallons a day, could have been completed in January 1895. had the Bill of 1893 passed.

But it did not pass; and I beg to call the attention of every one with a sense of fair play to the circumstances attending its rejection. The situation was this: Here was an engineer labouring under the heavy responsibility of finding water for over a

million people, prudently looking ahead, foreseeing a possible breakdown in the event of severe drought, and laying his plans accordingly. He fully foresaw the necessity, and prepared for it three years before it arose. 'Mr. Bryan,' said the Royal Commissioners, 'is not satisfied with his present storage for his present requirements, nor are we.' As a proof of his conviction that the need was serious, his directors had already bought the land in 1892 and intended to 'proceed immediately' with the construction of the reservoirs. All this was put before the Royal Commission. Indeed, Mr. Bryan felt the matter to be so urgent that he could not wait for the Commissioners to report, but went to Parliament in the following Session to obtain the necessary powers. The company brought in a Bill to authorise them 'to raise further money to enable them to fulfil their statutory obligations.' The County Council wrote on February 6 to complain that the Bill did not define the works to be executed, and again on February 25, reminding the company that the information was required 'to enable the London County Council to come to a conclusion as to the course which should be adopted.' 'That information,' continued the letter, 'has not been furnished, and until it is furnished, and unless it proves to be satisfactory, you must expect to find the London County Council as opponents to the second reading.' The information was furnished on March 2 in a letter defining

the various works and the money to be spent on each. That letter was never shown to Sir A. Binnie, and the Council proceeded to oppose the second reading without taking the opinion of their technical adviser on a purely technical question involving the well-being of over a million people. One can only conclude that they had made up their minds to oppose the Bill, and feared that the professional judgment of their engineer might interfere with that resolution.

Before the second reading the company circulated the following statement among Members of Parliament :

The object of the Bill is to authorise the East London Waterworks Company to raise further capital only for the purpose of fulfilling their statutory obligations and of meeting the increased demand for water within their district. The area which the company are bound to supply with water includes the East-end of London and the rapidly increasing districts adjoining on the east and north-east, and there is a large annual increase in the number of houses to be supplied, and in the quantity of water required, by reason of unbuilt-on land becoming covered with houses, and of small houses being replaced by large and improved dwellings. This involves new mains and pipes being laid to the new districts, and enlarged reservoirs, filter-beds, machinery, and other works being provided for giving the increased and improved supply. Parliament has laid upon the company the obligation of giving a full supply to all existing and future houses within their authorised area, but has only permitted the company

to raise from time to time so much capital as is urgently necessary, looking forward a reasonable time only. The new capital is no gain to the company ; on the contrary, not only is a larger debenture debt placed in front of the existing shares, but the auction clauses, and clauses which provide that the company shall pay over any profit derived from the new capital for the public good (*i.e.* the sinking fund clauses) makes the raising of this new capital an inconvenience and expense. The main objection in principle to the Bill is—as the company believe—that they should not raise new capital until the Royal Commission have issued their report ; but this objection is untenable because—be the report what it may—*the entire population in the company's district must be supplied with water*, and in their application for capital the company are only looking ahead for a short time in providing for what will during that time be necessary. The company are prepared to adduce the most reliable evidence to prove that *the works they propose are necessary and must be executed within a reasonable time to meet the demand for water*, and that the estimate of expenditure is reasonable.

In spite of this urgent appeal Parliament rejected the Bill on the second reading at the instance of the County Council. The reasons can best be given by a quotation from ‘Hansard.’ The Bill contained a clause (Clause 17) giving the company the same power to test and stamp fittings that municipalities possess, as has been previously explained. It has been contended that the opposition of the County Council was directed against this clause, but the

reader will see that this was not the case, the clause having been withdrawn before the second reading. The Bill came up on March 17, 1893, and its rejection was moved by Mr. James Stuart.

MR. JAMES STUART (Shoreditch, Hoxton): I rise to move that this Bill be read a second time this day six months. I do so on behalf of colleagues, many of whom represent districts affected by this Bill, and also on behalf of the London County Council, which, by a resolution passed on the 7th inst., negatived a proposal not to oppose this Bill. No doubt it contains many important details to which we very much objected, and some of which have been very imperfectly met in the statement sent round by the promoters to-day agreeing to certain modifications. *But I oppose the Bill because of its substance and its essence.* . . . We say that at this moment there are only two considerations which could possibly be urged in favour of the second reading of this Bill. The first is, that its provisions do not in any way traverse in any sense the matters with which the Royal Commission has to deal, and the other is, that there are special circumstances in connection with the East London Water Company, so peculiar and so urgent, that the report of the Royal Commission may very well for a moment be set aside. I shall contend in the briefest possible manner that in no sense does either of these conditions exist. . . . That being so, there is no case for that urgency which alone can be a reason for pressing the Bill through the House of Commons immediately before the Royal Commission reports on the whole question. . .

The CHAIRMAN OF WAYS AND MEANS (Mr. Mellor): The point I wish to press on the House is that it will incur considerable responsibility if it

refuses at this early stage to send the Bill to a Committee upstairs. I think there is *considerable force in the contention made, that after all there should be a sufficient supply of water for these populous neighbourhoods*, and that the object of the Bill is to provide that sufficient supply for a very large district; and, further, that if an outbreak of cholera occurs, and the supply of water in the district is shown to be insufficient, *grave responsibility will rest upon those who reject the Bill*.

MR. BENN (Tower Hamlets): I am sure that the London County Council would not oppose this Bill for a moment if such a course would be in any way likely to endanger the supply of water to the East of London. I may say we do not base our opposition on Clause 17. We accept the statement of the company that they are prepared to abandon the clause, and we are glad of it. But now, on the eve of the issue of the report of the Royal Commission, to add this financial burden to the purchase, which must come sooner or later, we say is very unfair. We therefore press the opposition to this Bill to a division, and we hope the House will support us.

The Bill was rejected by 176 to 152 votes. With 'Hansard' and the Local Government Board report before him, the reader can judge what sort of fair play the East London Company had, and where the responsibility for the breakdown really lay. The facts are important, because it was the first clear case in which the water supply was definitely made the sport of political interests and taken out of the province of the engineers. The opposition of the County Council would have been defensible, though

mistaken, had it been based on technical advice given with full knowledge of the circumstances; but the knowledge was withheld from their technical adviser, as we have seen. Again, the plea for awaiting the report of the Royal Commission was not without plausibility, had it been genuine; but it is impossible to think so when we find exactly the same opposition renewed in the following year, after the Commission had reported, and that in recommendation of the proposed works. Mr. Bryan, with the responsibility for providing water, and the consciousness of his insecurity upon him, came again in 1894 for permission to do his duty, and again the County Council opposed the Bill. Once more Mr. James Stuart urged its rejection. He said it had been rejected in the previous year on two grounds: 1st, that it was unnecessary and not urgent; 2nd, that it tended to prejudge the question of the future water supply of London. 'On the present occasion these arguments applied with intensified force.' He 'ventured to flatly deny' that the districts concerned ran any 'serious risks by reason of the insufficiency of the water supply.' He was supported by Mr. Shaw-Lefevre and other Radicals. On the other hand, Mr. Goschen protested, 'on behalf of the Metropolitan consumers, against the delay of another year in a matter of this importance'; Mr. R. G. Webster pointed out that the works proposed in the Bill were recommended by the Royal Commission as

immediately necessary ; and Mr. Chamberlain declared that the County Council's demand for delay was 'monstrous,' and that it was a 'most dangerous precedent that a private Bill should be dealt with upon political considerations.'

That dangerous precedent has been followed ever since with every single Bill dealing with the London water supply. In the end the second reading was most fortunately carried by one vote—228 to 227.

Had the County Council had their way the condition of East London in 1898 would have been deplorable indeed. As it was, the Bill was just too late to save the situation in 1895 and in 1896. If it had passed in 1893 part of the works would have been finished in time for the summer of 1895, as the Local Government Board inquiry showed, and the two new reservoirs in 1896. In that year the second failure of supply occurred. The constant service was interrupted on July 14, and resumed again on September 14. At first the water was only turned off at night, but in the last week in July the supply was cut down to six hours per diem. The effects were the same as in the previous year ; on neither occasion was public health adversely affected in the district. With regard to the causes, it is not necessary to add anything to what has been already said in regard to 1895. No attempt was made to indict the company for failing to fulfil its obligations, obviously because the case was covered by the previous inquiry.

This clears up two out of the three failures. The third was that of 1898, and it stands on a different footing. The circumstances indicate great weakness in the position of the East London Company. The interruption of the constant service began on August 22, and lasted more than three and a half months. The central fact of the occurrence was the almost total failure of the River Lea throughout the autumn. All the works authorised in 1894 had been completed by the summer of 1897, and were in full working order. The storage had been raised to 1,200 million gallons, and the pumping powers increased. Indeed, the company, warned by the experience of 1896, when the Lea fell considerably below any previous records in the month of August, had already gone to Parliament for powers to increase their storage still further, and those works are now under construction; but, as ill-luck would have it, the drought of the century overtook them first. The collapse of the river put all previous experience at defiance. So far back as the Duke of Richmond's Commission in 1868 the company's engineer had expressed mistrust of the Lea, which is the reason why in 1867 they obtained powers to draw 10 million gallons from the Thames; but the gaugings at Feilde's Weir, which go back to 1852, had never shown an average of less than 20 million gallons a day for the three driest months, and Mr. Bryan accordingly told Lord Balfour's

Commission that he thought he could reckon on that amount. In 1896, however, the flow for three months was 22, 19, and 14 millions. Had the river fallen no lower, and the drought lasted no longer in 1898, the resources would have sufficed to tide over the period without any breakdown ; but the drought went on for five months, from June to October, during which the daily flow for each month was 16, 12, 6, 2, and 5 million gallons. This extraordinary behaviour has been attributed in part to excessive pumping from deep wells in the Lea valley, which has lowered the springs. That is an important question, which must be taken into consideration in the future, especially in view of the complaints of the Hertfordshire population, that their wells and springs are being sucked dry to feed London. But the main cause was undoubtedly the deficiency of rainfall for the preceding twelve months, and more particularly in the winter months, when the underground sources which have to last through the summer are replenished. The average yearly fall in the Lea valley is about 27 inches, but from September 1897 to September 1898 it was only about $13\frac{1}{2}$ inches, or just half. No such deficiency has been observed during the eighty-two years in which records have been kept at Greenwich. As we know, the scarcity was felt over a very wide area, and many places suffered from want of water far more severely than East London.

Whether the company could have done more

than they did to mitigate the effects of the drought on their own resources, by taking water from other companies, is a question which has not yet been authoritatively settled. They had obtained powers to take water from other companies, but did not make the necessary connections until after the scarcity began, and they have been very severely blamed for neglecting to do so before. The answer put forward to this charge is, that the only company which had any water to spare before October was the Southwark and Vauxhall, and they would have had none if their Bill, which only became law at the end of July, had not passed. It was no use making communications unless there was something to communicate, even if permission to do so could have been obtained. The said Bill, it is to be observed, was opposed by the County Council, as was also the East London Bill authorising them to take the water. If, therefore, the Council had had its way there would have been no possibility of help at all. That point should be borne in mind when we come to consider the lessons of 1898 with regard to the future.

CHAPTER VIII

THE QUESTION OF PUBLIC CONTROL

IT is impossible to say when the question of public control was first mooted in regard to the Metropolitan water supply. Probably it has been more or less in the air since the beginning, for the principle is far older than that of joint-stock companies, and dates from the ancients. When supply by private enterprise developed on a considerable scale, people would naturally turn back to the older system and begin to ask why it was not adopted. The idea does not seem, however, to have commended itself to public opinion until a comparatively recent period; for in 1851 the Government proposed an amalgamation of the companies, which they would hardly have done had there been any strong feeling in favour of a public authority. The first definite and decided pronouncement on the subject appears to be the recommendation made by the Duke of Richmond's Commission, which was appointed in 1867 as a sort of corollary to the Rivers Pollution Commission, to inquire into water supply generally.

Their views on the point are the basis of the 1869

subsequent struggle which has gone on ever since at intervals, with more or less intensity, and has been so markedly accentuated in recent years. It is therefore desirable to examine the grounds on which that recommendation was made.

They were explicitly stated by the Commissioners under six headings, in addition to the general consideration of principle. In the first place, we notice that all the reasons given are hypothetical. There was no suggestion that the existing system had seriously failed to provide water, that the supply had fallen short or that consumers had suffered, which might be alleged as a positive substantial reason for the transference of ownership. On the contrary, the Commissioners pointed out in the body of their report that London had not suffered in the previous year when the supply had fallen short in a large number of towns, including Manchester, which then had a municipal supply and claimed no little superiority in consequence, according to the evidence given by the Town Clerk. What weighed on the minds of the Commissioners was the desirability of introducing certain improvements which they thought could only be done by a public authority. The most important of these was the constant supply. They held that this could not be adopted without the imposition of a double rate, which must be in public hands, after the example of Glasgow, Manchester, and other towns. The improvement of next importance was the pro-

vision of a proper supply to the poor. This is rather a curious point. The Commissioners held that it was impracticable under the existing system, apparently because the poor refused to have the water. No doubt this means that they did not want to pay for it, and the only way to get over the difficulty was to force it on them by a system of compulsory rating. 'Though every arrangement may be made for affording a proper supply wherever it is demanded, experience has shown that it is necessary in many cases to enforce its reception. We have reason to believe that the companies honestly do their best to supply the poor, and are inclined to be liberal in their arrangements for this purpose.'

Both these difficulties have actually been overcome. The constant service has been established, and the poor have exactly the same supply as every one else.

The remaining reasons were economy, improvement of quality by more efficient filtration, better purification of the river Thames, better provision of water for fire purposes, all of which it was thought would be promoted by 'consolidation under public control.'

The important points are the improvement of quality and of fire extinction. The latter has accompanied the introduction of the constant supply, and the former has been attained by the 'more stringent control' which the Commissioners mentioned as an

alternative remedy to change of ownership. The failure of the companies to carry out efficient filtration at that time was attested by the Registrar General's reports, which began to take cognisance of the London water in 1867. The analysis was carried out by Sir E. Frankland, and as the charge of inefficient filtration rested on his authority, all the more weight attaches to his subsequent emphatic testimony to the improvement effected. The purification of the Thames, which it was thought might be 'stimulated' by the establishment of a public water authority, has also been otherwise successfully promoted. As for economy, that is an open question; it all depends on the nature of the public authority. Directors' fees would be saved, but in other respects public control in London does not tend to economy.

The present state of the water supply, then, takes all the substance out of the Commission's recommendation, with the highly doubtful exception of a single point, namely, increased economy; but at the time the reasons given justly carried much weight.

1871 The Metropolis Water Act of 1871, which was the result of the recommendations made by the Commission, originally contained a clause providing for compulsory purchase, but it met with so much opposition that it was withdrawn, and the Act as passed merely provided for the constant supply and more stringent control. After that the question remained in abeyance for some time, though the

desirability of public control was re-affirmed by a Committee of the House of Lords in 1877.

Then, in 1880, came the first serious attempt 1880 to tackle the problem in the shape of a Bill, brought forward by Mr. Assheton Cross (now Lord Cross), who was Home Secretary at the time.

This Bill provided for the formation of a Water Trust, which was to take over the control of the water supply. There were to be three salaried and apparently permanent members—a chairman at 2,000*l.* a year, and two vice-chairmen at 1,800*l.* a year. The first chairman was to be nominated by the Government. Then there were to be six *ex officio* members—namely, the Lord Mayor, the Chairman of the Metropolitan Board of Works, and four others, representing respectively the Local Government Board, the Chief Commissioner of Works, the Commissioners of Sewers, and the Metropolitan Board of Works. The ratepayers were to be represented by twelve specially elected members. The transference was to be effected by the formation of a 3½ per cent. Water Stock, which the companies would receive in lieu of their undertakings, and the total purchase price was settled by agreement at about 31,000,000*l.*

Such were the outlines of the proposal, which came much nearer to a solution of the problem than any subsequent attempt has done. It was, in fact, the only proposal on which any sort of agreement has ever been arrived at. It came to grief on the

financial question. Lord Cross, who is no bad judge, said, in introducing the Bill, that he thought the price 'fair and reasonable,' and Mr. Chamberlain remarked that the principles laid down by the Home Secretary were precisely identical with those which guided the Corporation of Birmingham in the transfer of their water supply to the municipality. But the question was never debated in the House. It aroused much opposition outside, on the ground that the purchase price was too high; and a Select Committee, presided over by Sir William Harcourt, to which it was referred, reported against the bargain made by the Home Secretary. Therewith the scheme fell to the ground.

Sir W. Harcourt's Committee, though disapproving of that particular scheme, once more affirmed 'that it is expedient that the supply of water to the metropolis should be placed under the control of some public body, which shall *represent the interests and command the confidence of the water consumers.*' Those words are worth bearing in mind, for they touch one of the chief difficulties surrounding the question. No such body has yet been discovered. The London County Council may be taken to answer for the intra-Metropolitan consumers, but it neither represents the interests nor commands the confidence of the outside consumers, who will be the majority in that future to which the Council itself insists upon our looking forward. However, this is rather anticipating.

After 1880 the whole thing fell once more into abeyance, though the Metropolitan Board of Works seem to have put forward some feeble sort of claim to be the water authority. For another decade the old purveyors went on, improving their supply, gradually extending the constant service, making filtration more efficient, and generally bringing things up to the high standard revealed at the inquiry held by Lord Balfour's Commission. They were not let alone, of course, but the questions that arose related mostly to finance, and resulted in further restrictions with regard to the charging of rates and the raising of capital. There was no serious interference with their plans for providing water, and, as a matter of fact, very extensive works were carried out at this period, to the great advantage of the public.

Then in 1889 came the County Council. The 1889 opportunity for introducing public control seemed fair. Here was a thoroughly representative body, so far as elections can make one, brand new, starting with the general goodwill of the public, full of zeal, vigour and enthusiasm; and it lost no time in setting to work. On March 19, 1889, before ever a full meeting had been held, it was resolved to appoint a Special Committee 'to consider the steps to be taken as to acquiring the undertakings now supplying London with water.' They were in such a hurry that they wanted their Parliamentary Committee to consider 'whether the requisite powers

cannot be obtained by some Bill promoted this Session.' This presumably meant powers for making inquiries and preparing legislation. Ten years have gone by, and they are still preparing that legislation, with far less apparent prospect of success, although some 50,000*l.* of public money have been spent on it one way and another.

The story of those ten years is an uncommonly tangled tale. It would be too much to ask any one to follow its windings very closely; but certain leading events must be pointed out as clearly and briefly as possible.

1890 The Council first attacked the subject on the financial side by trying to obtain a suspension of the rights of the water companies to such increase of rates as they might become entitled to under the quinquennial re-assessment of property due in 1891. Here we have the first application of the policy of cheapening the water undertakings. The increase of rates by the quinquennial valuation was held to be 'prejudicial to any future acquisition of the water supply.' Nothing came of this. The next step was to institute inquiries into the water supply and to negotiate with the companies for the disposal of their business. Nothing came of either, except the request to the Government for an inquiry, which resulted in the appointment of the Balfour Commission (*see* Chapter VI.). All this was in 1890. Its effect was principally to stir the subject up

generally, for in the following year, 1891, Parliament 1891 was fairly pelted with Bills for settling the water question. The County Council brought in one Bill, the Corporation a second, and the Vestries a third. The first was blocked and came to nought. The Corporation's effort, known as the 'London Water Commission Bill,' proposed to constitute a Commission with power to acquire waterworks and supply water. It was to consist of fifty-one members, or more, representing the London County Council (21), the City (6), the Middlesex and Surrey County Councils (4 each), the Essex ditto (3), also Hertfordshire, Buckinghamshire, Berkshire and Oxfordshire (1 each), with West Ham and six towns on the Thames (1 each). The Local Government Board and the Board of Agriculture were also to be represented. This scheme was opposed by the London County Council.

The Vestries' Bill, known as the 'Metropolis Water Supply Bill,' was brought in by Sir A. Borthwick, Mr. Baumann, Mr. Fisher, Mr. Whitmore, and Sir A. Rollit. It proposed to hand over the water supply to a Trust, consisting of thirty-nine members, specially elected for the purpose, and representing the whole area of 'Water London,' arranged in Parliamentary Divisions. The elections were to be triennial, and held on the same day as the County Council's elections. The Trust was to acquire all the undertakings of the companies on terms to be fixed by a

Board of Arbitrators, and paid in water stock or in cash. The Board of Arbitrators were to be nominated by the Local Government Board, the Institute of Bankers, the Institution of Civil Engineers, and the Institute of Surveyors. Provision was made for enabling the London County Council to take the place of the Water Trust. With the exception of the last provision, the scheme was substantially on the same lines as Lord Cross's proposal in 1880. It was opposed by the London County Council.

Both Bills were referred to a Select Committee, of which Sir Matthew White Ridley was Chairman. Lord Farrer gave evidence, on behalf of the County Council, that the question was too large to be left to an arbitrator. In the end the Select Committee reported against both Bills, and said that neither of them appeared 'calculated to effect a satisfactory solution of the problem.' The Committee, however, assumed 'that, in the opinion of Parliament, it is desirable to establish a single public representative water authority for the Metropolis,' apparently on the ground that the Duke of Richmond's Commission and Sir W. Harcourt's Committee had recommended it. They further thought that the whole question should be thoroughly inquired into by the County Council, and that if that body were constituted the water authority, it 'should be required to purchase the undertakings of the water companies by agreement, or, failing agreement, by arbitration

within a fixed period.' This did not suit the views of the County Council, which fought rather shy of purchase by arbitration, and was inclined to coquet with the idea of a competitive supply, though willing to acquire the undertakings 'if they could be obtained on fair and reasonable terms,' which meant something far below the Stock Exchange value. Meanwhile they came to an agreement with the City Corporation to pull together to a certain extent.

Then came the Balfour Commission, appointed 1892 largely on account of the strong representations made by Sir M. White Ridley's Committee as to the need for inquiry into the existing supply as a preliminary to the question of ownership.

The report of the Commission, constituting 1893 as it did a complete vindication of the existing supply and its capabilities of future development, knocked the bottom out of the campaign for abolishing the companies, so far as it rested on the supposed inadequacy of their supply.

This brings us down to 1894. The County 1894 Council, which had meanwhile obtained powers to spend 10,000*l.* in prosecuting inquiries, and had instructed their engineer to report on 'the available sources of water supply for London,' returned to the charge maugre the Balfour Commission. They laid down the proposition that 'the only acceptable solution of the general problem was, that the ultimate control of the water supply of the metropolis should

be transferred from the companies to the London County Council,' and they assumed that this was 'also the view of the public of London.' They recognised the importance of the financial aspect of the question, and affirmed their willingness to purchase on 'fair and reasonable terms,' but declined to recognise any 'monopoly right' on the part of the companies. If terms could not be arranged, application was to be made to Parliament to settle them. The companies were communicated with, but expressed no desire to sell, though 'the majority stated that they were prepared to carefully consider any definite proposal which might be made to them by the Council.' No such proposal being forthcoming, the Council considered that 'they had failed,' as they put it, 'in their endeavour to negotiate with the companies,' and proceeded to prepare Bills for compulsory acquisition in Parliament. The 'endeavours to negotiate' are curious. The companies said in effect: 'Make us an offer, and we will consider it,' which was businesslike enough; but apparently the Council were afraid to commit themselves. The failure to negotiate was their own.

Meanwhile the outside authorities concerned in the matter were approached, and a conference was held, but no agreement was reached. The Chairman of the Middlesex County Council declared the proposals of the London County Council to be 'entirely unacceptable not only to Middlesex, but

also to Surrey and Kent.' Separate negotiations with Surrey were subsequently carried on, and an agreement entered into with respect to the water supply of the Southwark and Lambeth companies.

Here we have the two great difficulties—the terms of purchase and the divergent views of outside authorities—first definitely recognised. Both still remain as far from settlement as ever.

The Bills came on in the following year—eight 1895 of them—one for each company. They provided for compulsory purchase by arbitration, but the arbitration was to be of an unprecedented kind. The arbitrators were allowed very restricted powers; they were specially instructed to take certain things into consideration—to wit, things tending to lower the value of the water concerns; and by inference they were not to take certain others tending in the opposite direction, such as the report of the Balfour Commission, for instance. The Bills were referred to a Select Committee under the chairmanship of Mr. D. Plunket (now Lord Rathmore), and the arbitration clause was at once condemned. The Committee insisted that the arbitrators were not to be precluded from 'entertaining all the circumstances which they may think it right to take into their consideration,' and declined to fetter their discretion by special instructions. 'The Committee do not feel justified in endeavouring to influence in any way the impartial exercise of that discretion, and they

are unwilling by special reference to particular circumstances to seem to prejudge their consideration.' This amounted to a severe rebuke of the unfair character of the arbitration proposed.

The County Council reconsidered their position, and after some delay proposed a fresh arbitration clause, which went to the opposite extreme. It provided that 'the arbitrators shall inquire into and consider all the circumstances of the case and the contentions of Council and the companies respectively, and may deal with the same or any of them as they in their absolute and unfettered discretion think fit, in such terms and in such manner in all respects as they think fair, reasonable and expedient, and as fully and effectually as could be done by Act of Parliament.' It is difficult to understand the intention of this singularly worded clause, which appears to give the arbitrators the power of Parliament itself, in striking contradiction to the previous contention of the County Council that the matter was too large to be left to arbitration. Under this clause the arbitrators might award sixpence or a hundred millions. It was provisionally accepted by the Plunket Committee, subject to their future decision on hearing the other side; and they expressly reserved their decision on the concluding words. There the proceedings rested. In view of the lateness of the Session and the coming dissolution the Bills were suspended. Mr. Shaw-Lefevre has lately

said that but for the dissolution they would have passed and become law. That is, of course, a pure assumption, but if it is correct the County Council had only their own unfair form of arbitration to thank for the delay which caused their Bill to miscarry and lost them a golden opportunity.

About this time or a little earlier the problem became complicated by the appearance on the scene of the scheme for bringing water from Wales. The engineer had been instructed early in 1894 to 'report on the site and yield of other sources of water supply and as to the method which might be adopted for storing and conveying water to London with estimates of cost.' His very interesting report was to the effect that an alternative supply of 415 million gallons a day could be got from the Usk and Wye at a cost of 38,800,000*l.* He suggested the abandonment of the Thames and the Lea, but the retention of the existing chalk wells, which would add 67 million gallons to the proposed 415 millions from Wales, and suffice for the needs of London up to 1945. Fortified by this technical evidence the Council felt in a position to throw over the Balfour Commission, and to adopt a new supply as part of their policy. They resolved that the scheme presented to the Commission, for taking more water from the rivers, was 'not the proper method of meeting the future wants of London,' and that 'the true

solution of the problem was the obtaining of the necessary additional supplies from a purer source.'

1896

In the following year their suspended purchase Bills were re-introduced with the new arbitration clause, commonly known as the 'Plunket clause,' though it was never formally passed by Mr. Plunket's committee; but they were rejected by the new House of Commons under peculiar circumstances. The Government had announced their intention of dealing with the question themselves, and a Bill for that purpose, called the 'Metropolitan Counties Water Board' Bill, was introduced by Lord James in the House of Lords. It proposed to establish a Water Board or Trust, to consist of thirty members—sixteen appointed by the London County Council; two each by the City Corporation, West Ham, Middlesex and Essex; and one each by Croydon, Surrey, Kent, Hertford, the Thames and Lea Conservancies. It was to start with the powers of control possessed by the London County Council, and was afterwards to proceed as it thought best with regard to acquiring or controlling the water supply. Its reception showed the increasingly political character which the water question had now assumed. On the second reading in the House of Lords it was opposed by Lord Rosebery and Lord Tweedmouth, but it passed by a large majority, and with some amendments in Committee was sent to the House of Commons. Here an attempt on the part

of the Government to effect a compromise between their own Bill and the Purchase Bill of the County Council had failed. It was suggested that both should go on, and at the last moment the County Council should be substituted for the proposed Water Board, on the condition that the Plunket arbitration clause should be dropped and the ordinary arbitration clause inserted in its place. The other side did not see their way to accept this condition, and the Bill was not proceeded with. It was also opposed by the outside authorities on the ground that it would place them under the thumb of the London County Council. We thus see the two great difficulties—terms of purchase and the outside areas—reappearing in more definite shape and again blocking the way.

In the following year the financial question 1897 loomed up again. More mature consideration had been given to it in the meantime, and the more closely it was examined by cool-headed men the more formidable did it appear. In particular Sir John Lubbock, whose position as a financier and former vice-chairman of the County Council lends great weight to his opinion, expressed very forcible views on the inadvisability of purchase. The County Council's Bills were brought forward once more ; but the House of Commons, impressed by the need of fuller consideration, again rejected them, and the Government appointed a Royal Commission, with

Lord Llandaff as Chairman, to inquire into the advisability of purchase and the position of the outside authorities. The terms of reference were :

(1) To inquire and report whether having regard to financial considerations and to present and prospective requirements as regards water supply in the districts within the limits of supply of the Metropolitan water companies, it is desirable in the interests of the ratepayers and water consumers in those districts that the undertakings of the water companies should be acquired and managed either—

(a) by one authority ; or

(b) by several authorities ;

and if so what should be such authority or authorities. To what extent physical severance of the works and other property and sources of supply of the several companies, and the division thereof between different local authorities within the limits of supply are practicable and desirable, and what are the legal powers necessary to give effect to any such arrangement.

(2) If the undertakings are not so acquired, whether additional powers of control should be exercised by local or other authorities, and, if so, what those powers should be.

An additional paragraph relates to the practicability of connecting the mains of the companies, but it is omitted here as foreign to the question of public control. On the other subjects of inquiry the Commission is still engaged, and meanwhile the London County Council has made a new move in consequence of the events of 1898, which will be discussed in a subsequent chapter.

CHAPTER IX

THE CONSUMER BETWEEN TWO STOOLS

As part of the story of public control I have in the last chapter traced the steps taken by the London County Council to fulfil its aspirations in that direction. Those aspirations were natural and laudable in themselves, and were no doubt originally inspired by a sincere regard for the public welfare, though the policy by which it was sought to realise them has not been very happy. The end seems as far off as ever, if not further; and meantime the public interest has suffered greatly. Previous to the creation of the County Council, as has already been pointed out, the Platonic enunciation of the principle of public control did not interfere with the current supply of water. It merely resulted in imposing conditions on the raising of fresh capital by the companies. Since 1886 the sums raised from time to time for the construction of new works have been made subject to a sinking fund with a view to the ultimate extinction of the capital on the hypothesis that the business would be taken over some day or other. The companies consider this a very onerous

condition, and it ought to be borne in mind when their financial position is under consideration; but it has not affected the public. With the active campaign started and mainly conducted by the County Council the case is very different.

In view of their ever impending but never realised acquisition of the water supply they have consistently offered the most uncompromising and powerful opposition to the construction of all new works at the hands of the companies, however urgently needed they might be. That they have been urgently needed requires no proof; it is a matter of notoriety. For as luck would have it, we have entered on a period of drought since the Council was founded, and during the last six years we have experienced a succession of extraordinary seasons, culminating in 1898. The resources of several of the companies have been taxed to the uttermost, and in some cases over-taxed, so that the engineers have been compelled, by actual need or ordinary prudence, to look forward to the provision of largely increased accommodation for the future. This is a matter of common sense which everybody can understand. Then the inquiry held by the Balfour Commission, and the recommendations contained in their report, have obliged certain of the companies to increase their resources in order to comply with the conditions laid down. The consequence is that a great many Bills have been promoted in Parliament. The

County Council have opposed them all, not merely for the purpose of amending them, but with the object of totally defeating them. Bills of this kind always meet with a certain opposition, but it is generally directed to some particular point, the objectors contending that their interests will be injuriously affected in some definite respect, which is probably susceptible of adjustment. The abstract objection on principle is totally different, and obviously very dangerous to the public interest in regard to such a vital matter as water supply—how dangerous has been already shown by the unhappy effects of the obstruction offered to the East London Company in 1893.

Fortunately Parliament, warned by that example, or possibly on account of the sweeping change in its composition which occurred in 1895, has been more careful in the matter, and has not lent so ready an ear to the voice of the County Council. Nevertheless it has been put in a quandary, to which definite expression has been given by a Select Committee; and the very doubtful fate of every water Bill which now comes before the House, however urgent and necessary it may be, is a distinct menace to the welfare of the community. To make the situation quite clear it is necessary to give some instances in addition to those already discussed in reference to the events in East London in 1895. Fifteen Bills have been introduced altogether by the

companies since 1890, and they have all been opposed by the County Council with, I believe, one exception. It will suffice to take two or three of the most important.

In 1894 the Southwark and Vauxhall Company introduced a Bill to raise money for the construction of works to improve their subsiding storage and filtration in accordance with the recommendations of the Balfour Commission. The Commissioners, speaking of the treatment of water after abstraction from the river, had said :

It does not come within the terms of our reference to lay down what should be the exact regulations as regards filtration . . . nor, as regards the subsidence tanks, how many days' storage should be deemed sufficient so as to obviate the necessity of taking turbid storm water, and to allow of due settlement, but we cannot shut our eyes to the fact that the provision for these purposes differs enormously in the different companies, and in some of them is to our mind quite inadequate.

The Southwark Company was the worst provided with storage of all those drawing river water, having less than two days' supply, and they accordingly sought powers to make three reservoirs—bringing the storage up to sixteen days—and some additional filter-beds. This was a reasonable and proper proposal clearly in the public interest. So Parliament obviously thought, for the Bill was eventually passed with some minor alterations. But the County

Council opposed it *in toto* on the ground that they were going to buy up the company immediately or very soon. They admitted—indeed, they insisted—that the company wanted additional storage badly, that they had come to the end of their tether, that they were unable to fulfil their statutory obligations, and so on; but all this was urged not as a convincing reason for the immediate commencement of these highly necessary works, as the simple-minded consumer might suppose, but as reasons for forbidding them. Why? Because it would put the company in a much better position to fulfil their obligations to the public, and therefore in a better position to make terms with the County Council. The argument is so familiar to those engaged in these controversies, on both sides, that it is almost taken for granted; but I venture to say it will strike the plain non-political consumer as a very extraordinary line to take, and that there may be no doubt, I will quote from the Council's petition against the Bill, and from the speech of their advocate:

Your petitioners would point out that this company has not only long since exhausted its concession of water, and has been deriving a revenue from the sale of water to which it is not entitled; but—more probably than any other of the Metropolitan companies—it has *failed to make adequate provision for storage and filtration*, and your petitioners submit that it is most inexpedient and undesirable that the company should obtain further concessions and powers from Parliament.

Again :

Your petitioners are advised that if the purity of the water derived from the Thames and the Lea is to be kept suitable for domestic purposes, *very considerable further works and expenditure will be necessary in providing additional storage and improved methods of filtration.*

‘If that is so, then the sooner they are begun the better,’ will be the unhesitating comment of the consumer. ‘No, no,’ say the County Council, ‘because we are going to buy them up directly, and if their water is all right we shall have to pay them more.’

Here is the plea of counsel before the House of Lords :

Now, my Lords, let me say at once I do not for a moment deny that this company is insufficiently supplied with storage ; I do not for a moment deny that, not merely now, but long ago, it ought to have provided the further storage it required. But I do say this, that this is not a *bonâ fide* application to Parliament in order to meet the requirements of the company ; but it is an application pressed and hurried on with a view of putting the company in a position different from what they are now occupying, having regard solely to the fact that they are about very shortly to be dealt with by the purchasing authority. . . . So that your Lordships see the effect will be this : not only that the works will be there, which will have to be bought, but there will be this statement : We obtained power from Parliament to strengthen our hands in this respect, we can therefore discharge all our duties and liabilities, and we

are in much stronger and much more stable position now than we otherwise should have been.

The attitude of the Council here is perfectly plain, and to a certain extent one sympathises with it. They are dazzled by this will-o'-the-wisp of immediate transfer, and can see nothing else. They have always been going to have the water in their hands in a few months, or next year at latest, and if it were really so there would be reason in their protest against new works on the eve of purchase. But that is just where they have always made the mistake, and in doing so they have shown a disregard for the consumer's interests which nothing can justify. In the quotation given above they state by the mouth of counsel that their deliberate object is to prevent the company from putting itself in a position to fulfil its statutory obligations—that is to say, to give a proper supply of water. They want it to break down, or they say that it has already broken down, and they want to prevent it from renovating itself. But what about the consumer? He does not care a straw about the transfer. He wants a proper supply of water, and it is to his interest that the company shall not break down or shall be renovated as soon as possible, and placed in that 'strong and stable' position which the County Council are so anxious to prevent it from occupying. And what about the engineer who has nothing to do with transfers, but is professionally responsible for

providing water, and blamed if it fails? Is it fair or right or decent that he should be put in such a position?

The reader can see now why the County Council frustrated the plans of the East London Company with such a light heart in 1893, and tried again to do so in 1894. According to their policy the more necessary the works proposed the more reason for preventing their construction, because they would raise the company from a doubtful to a 'strong and stable' position with regard to their ability to fulfil their statutory obligations. If the Council had only pursued that policy of obstruction in the earlier days, when a sanguine mind might be excused for expecting an early transfer of the water supply, their conduct would have been less strange, though still very short-sighted, for in any case the works they opposed would have been necessary long before a fresh supply could have been obtained from anywhere else, and they would themselves have been in a great difficulty after entering into possession during those dry and hot seasons which followed. But they have continued to pursue it up to the present time, although the prospect of entering quickly into possession became year by year more shadowy as the difficulties of settling the question were more fully realised.

The disadvantages of the situation were recognised by Parliament in 1896, when no fewer than five Bills were brought up by different companies

and referred to a Select Committee presided over by Sir Joseph Pease. The Committee had special instructions—

Not to confer additional powers except so far as the same may be proved to the satisfaction of the Committee to be required for works or for the acquisition of land, the construction or acquisition of which cannot be postponed without detriment to the interests of the public.

In their report the Committee made the following weighty observations :

Your Committee would, with great deference, point out that the present position of the London water supply is not in accordance with the public interest.

Under the conditions of issuing new capital [*i.e.* the auction clauses and the sinking fund] the public is steadily acquiring an interest which tends to weaken the enterprise of the companies as private concerns, whilst, on the other hand, the consumer is left without that care of his interests which is ensured by placing the supply under a representative body in whose election he is personally interested.

In the meantime, each Session applications to Parliament, sometimes inconsistent and usually without concert with one another, are being made which are opposed by local authorities and private persons. These proceedings are annually costing a very large sum of money, and Committees of Parliament, being obliged to consider each proposal separately without reference to any general scheme, have the almost impossible task assigned them of deciding what powers should be granted to the water companies in order that they may provide for the wants of an ever-increasing population, and

what powers withheld to avoid the water companies acquiring an increased value, in the event of purchase by a public authority.

From this acknowledged anomalous position it would be greatly to the public interest that both the water companies and the inhabitants of London should be speedily freed.

In other words, real and present needs stand in great danger of being sacrificed to a problematical future. Parliament has to decide between them, and it has sometimes decided wrongly, as the events have proved. In 1896 the Committee appears to have trod the razor edge with success, and no miscarriage occurred. But the strain was very great. In view of the instructions to the Committee that only works which could not be postponed without detriment to the public interest were to be sanctioned, it was the cue of the County Council to prove that everything could be postponed, and they did their best to prove it. On the other hand, the promoters of the Bills were equally concerned to prove the contrary. They have been much abused and accused of bad faith for stating a case quite inconsistent with that laid before the Balfour Commission; and certainly the estimates of requirements brought forward in 1896 and since differ very much from those made in 1892. The influence of subsequent experience, of several exceptional seasons and a new basis of calculation in producing the change of attitude, has been already referred to; but apart

from that, the companies were placed under the necessity of making out the strongest possible case by the instructions to the Committee and by the attitude of their opponents, who did exactly the same thing themselves. People usually do make the most of their case in strongly contested matters. The County Council have changed their ground over and over again, and to accuse the other side of bad faith is both silly and spiteful. The main point is that the companies had reason to think from recent increase in demand that they would shortly need enlarged resources to make the supply safe; and everybody knows now that they were quite right. It is a matter of profound thankfulness now that the powers were granted and the works begun. So far from not being urgent they should have been started three years sooner, and then East London need never have gone on short commons, as the New River would have been in a position to pass on whatever was necessary to make up the deficiency. Of course all that could not have been foreseen at the time; but the fact remains that the contention of the County Council was absolutely wrong and contrary to the public interest. After all, the ultimate object is that we should have water. Installing a public authority is, at the highest, merely a means to that end; and the mischief of the last ten years is that a good many people have mistaken the means for the end, and set it up as an end in itself.

The most important of these 1896 Bills was one brought in conjointly by the New River, Grand Junction, and West Middlesex Companies for authorising the commencement of the Staines reservoir scheme. This was the plan suggested by Messrs. Hunter and Fraser to the Balfour Commission, and approved by them, for enabling more water to be drawn from the Thames. The Bill of 1896 represented the first instalment of that scheme. Briefly, it was for the construction of reservoirs at Staines for the storage of surplus water when the river was in good flow, so that an additional quantity of 35 million gallons a day might be available between the three companies. Of its desirability it is only necessary to say that since the summer of 1898 London has the best reason to look forward with suspense to the completion of those reservoirs. The County Council contended that there was no need for them and no danger of a water famine. Some extracts from the evidence of Mr. W. H. Dickinson, Chairman of the Council's Water Committee, and of the engineer, will show the position assumed :

MR. DICKINSON : We do not think the necessity exists, and if this scheme requires five years to be carried out, we do not think that anybody would suffer by the time being postponed another two years.

But are you advised by your engineers and others whom you have consulted, that there is no necessity whatever for present purposes for the provision of

any further Bill than they have got now?—That is clearly our view at the present moment.

SIR A. BINNIE: I do not think they want new storage.

At all events you would not like that London should run the risk of starving in the course of the next ten or fifteen years?—Most certainly not; nor is there any fear of its doing so.

So that in your view, for each of these companies, dealing with them in detail, there is plenty of water, and there will be plenty of water under the existing powers to meet even a time of maximum pressure?—Yes, there will. . . . In your view are any new water powers required at the present time?—There are not.

Both these witnesses, on being pressed as to what should be done in case they proved to be wrong, and more water were wanted in times of great emergency, replied that more might be drawn direct from the river without storage.

How would you get the water?—We should get the water by providing increased facilities at the present intakes.

By giving increased power to take water from the Thames when it was wanted?—If it was possible to take it.

Do not you think that it would be undesirable to take water from the river when it could spare it the least, and when its condition was the worst?—That is a question for the engineers.

It is suggested that a temporary provision might be made to take water from the Thames in addition

to our present supply. And then you say that you would not object?—That is so.

Then I point out to you, that the defect of the suggestion is that that would be, if there were no storage, to take it from the river when it wants it the most and when it is in the worst condition?—I think if the companies had a temporary power to take more water than they have, they would find it a great deal more easy to tide over the times.

These passages from Mr. Dickinson's evidence in 1896, read very curiously in the light of the extreme importance attached at other times to the necessity of preserving every drop of the river when it is low. The Staines scheme was designed precisely for that very purpose, to avoid an over-draught on the river when it fell below a certain point; and yet it was opposed by those who profess the greatest anxiety for the maintenance of the river. They would rather draw upon it when at the lowest, than let the companies make new reservoirs. The reason given is the old one.

However, somebody or another, you will agree with me, will require to provide for the growing wants of London for fifteen years to come?—Certainly.

And you ask that this scheme shall be postponed for a scheme in the clouds, or in the minds of the London County Council?—Not only in the minds of the London County Council, but it is in the minds of the Government too. The water question of London must be settled in the course of the next two or three years.

In 1897, as I have mentioned in a previous chapter, the East London Company, warned by the lesson of 1896, applied for powers to make a further large increase in their storage, bringing it up to 2,000 million gallons; and also to take water from other companies in case of an emergency arising before the completion of the reservoirs. The emergency did arise in the very next year, when the great drought occurred; and most fortunate it was for East London that the powers had been obtained, as through them five million gallons a day were poured into the district from the middle of September, and about eight millions from the middle of October. But both these most necessary steps were opposed by the County Council on the usual grounds. They further opposed the Bill brought forward by the Southwark and Vauxhall Company in 1898, which alone enabled them to give that invaluable assistance to the East London. This Southwark Bill of 1898 is another case which shows how the actual interests of the river, as well as of consumers, are thrown over at pleasure to suit the conditions of a visionary future.

The Southwark Company by an agreement with the Thames Conservancy in 1886 were entitled to take $24\frac{1}{2}$ million gallons a day from the river; but of late years they have required a good deal more, and they had consequently been in the habit of making an over-draught. There was some doubt as to the legality of this proceeding until 1896, when the

Conservators had it settled by the Court of Queen's Bench. The Court decided that the agreement was made statutory by the Conservancy Act of 1894, and that the Company was limited to the stated amount. But the people must have the water, and the Conservators, who have always acted in a very reasonable manner while sufficiently guarding the interests of the river, made an arrangement of a temporary character with the company, whereby they obtained powers in 1897 authorising them to make an overdraught of $20\frac{1}{2}$ million gallons, on condition that in 1898 they would bring in a Bill for the construction of such storage as would enable them to take that amount without injuriously affecting the river. That was the Bill in question. There was no dispute about the absolute need of the water; in fact, they were drawing that very summer nearly 35 million gallons from the river, and it was admitted that, whoever owned the water supply, reservoirs would have to be built. Nevertheless, the Council opposed the Bill because it was promoted by the Southwark Company. They denied urgency, and put forward the argument about the company's status once more.

The scheme of this Bill appears to be to acquire from Parliament a new concession in order to convert this company from its present status of a company unable to fulfil its statutory obligations into one which in the event of a transfer to a public authority might enable it to claim compensation on a different basis, and to effect this by obtaining new

powers which could only be to the advantage of the company at the cost and to the injury of the inhabitants of London.

That is to say, in order that the company might be bought cheap some time or other, either consumers were to go without meantime, or the river was to be drawn upon to supply them without safeguards properly insisted on by the Conservators and proposed in the Bill according to the bargain made with them by the company.

In short, the present purveyors of water, who are still the only authorised purveyors, are never to do anything. Any reasons, however contradictory, are good enough to urge in order to checkmate them. At one time it is that they have no need to do anything, at another the exact opposite; the very need is urged as a reason.

Other instances of the same thing could be given, but the foregoing will sufficiently illustrate the disadvantages and dangers of sitting on two stools in the matter of water supply, and will lead up to an intelligent comprehension of the situation immediately before us.

CHAPTER X

1898 AND THE PRESENT SITUATION

THE extraordinary season of 1898 has produced important changes in the situation, and among other results of a deficient rainfall is a flood of new Bills. The London County Council is responsible for four and the water companies for three. The former have two objects: (1) purchase of the present water undertakings *en bloc*, (2) procuring an additional supply from Wales. The companies' Bills include a conjoint one—the first ever brought forward—intended to provide for effective intercommunication between their several systems. The remaining two emanate from the East London Company, and are designed to strengthen their position and prevent a recurrence of the recent breakdown both in the immediate and the remoter future. It will be seen by the attentive reader that a change of front has taken place on both sides. The County Council propose to purchase the companies, not singly as heretofore, but all together, without waiting for the Royal Commission to report on the whole question; and

they have definitely tacked on to that sufficiently large step the proposal to bring water from Wales. Indeed, the Welsh scheme is put forward partly as a reason for pushing the wholly distinct question of purchase. On the other hand, the stress of the situation has caused the companies to unite their forces and to constitute themselves, for the practical purposes of water supply, a single authority. All this has really been brought about by the breakdown in East London.

Some account of that occurrence and its cause has already been given in a previous chapter ; but as the effects of the drought extended very much further than the Lea, it is necessary to say a little more about it in order to make the position quite clear.

As for the drought itself, the following figures for the rainfall are furnished by Mr. G. J. Symons, F.R.S. who, as every one knows, has been the leading authority on the subject for over thirty years. The figures only refer to the observations recorded at Camden Square in the north of London, and it should be understood that in other localities the rainfall may differ to a small extent from these records ; but they substantially represent the state of things over the greater part of the south of England, and in the absence of complete and particular observations for the Thames and Lea valleys, which take some time to put together, they will suffice for the purpose. They show the rainfall

and the deviation from the mean for the twelve months October 1897 to September 1898 inclusive :

						Rainfall Inches	Difference from average
1897	October	.	.	.	.	.56	- 2.15
"	November	.	.	.	.	1.05	- 1.25
"	December	.	.	.	.	2.20	- .07
1898	January	.	.	.	.	.73	- 1.29
"	February	.	.	.	.	1.08	- .53
"	March	.	.	.	.	1.46	- .25
"	April .	.	.	.	.	1.01	- .65
"	May .	.	.	.	.	2.26	+ .34
"	June .	.	.	.	.	1.11	- 1.12
"	July .	.	.	.	.	1.09	- 1.30
"	August	.	.	.	.	1.18	- 1.21
"	September	.	.	.	.	.33	- 2.06
Total						14.06	-11.40

For these twelve months, therefore, the rainfall was only about 55 per cent. of the average, or not much more than half. No such deficiency has ever been recorded before. According to the Registrar General's quarterly report, the rainfall at Greenwich during the same period was 14.76 inches, 'being smaller than in any twelve months ending September 30 back to 1815; the nearest approach was seventeen inches in the twelve months ending September 30, 1864.' The effect on springs and rivers of this extraordinary deficit was increased by the fact that a very large proportion of it occurred in the winter, when the underground sources are wont to be replenished. Instead of rising, as they usually do, up to April in preparation for the summer, they were

falling steadily from the beginning of the year. Hence it is no wonder that wells and springs ran dry, and the rivers fell to a level never known before. The figures for the river Lea have been already given, but the Thames was also greatly affected, and in September the daily flow at Teddington Weir only averaged 77 million gallons; that is to say, there was only that amount left in the river after the companies had abstracted the 130 millions required for the supply of London. It is very much less than has ever been observed before, the previous lowest having been considerably over 100 millions. Any one can understand that this new experience must modify previous expectations, founded on less extreme droughts; for it is the minimum flow which determines the calculations of engineers with regard to the resources required to tide over a period of emergency. The less water there is available in the river at the worst, the more must be stored beforehand to supplement the temporary deficiency. Upon that point as a general proposition there can be no difference of opinion. But in regard to the particular case under consideration some people go very much further, and argue that in view of what happened to these London rivers in 1898 it is absolutely necessary to obtain an additional supply from fresh sources. That is the position taken up by the County Council and accepted by many others. On the face of it the proposition seems most reasonable, if not unanswer-

able, to those who have not studied the subject very closely, and it is not surprising that even intelligent and disinterested persons should regard it as a foregone conclusion that more water must be got from somewhere. They picture the Lea absolutely run dry and the Thames very nearly so ; and it seems self-evident that these streams are already overtaxed, so that nothing is left but to go elsewhere. Elsewhere means Wales, as no other sources are proposed at the present time ; and in Wales, it is understood, there is any quantity of water which only needs bringing to London to relieve the strain on the worn-out rivers near at hand. So the case is represented, broadly speaking, and apparently accepted by a considerable section of the public. I shall have no difficulty in showing, however, that this is a complete misapprehension of the real question at issue and of the meaning of 'additional' supplies. In order to do so I must begin by explaining what the Welsh scheme is.

In 1894, as mentioned in Chapter VIII., the County Council instructed their engineer to report on 'the site and yield of other sources of water supply, and as to the method which might be adopted for storing and conveying water to London, with estimates of cost.' His report (*see* Appendix) is dated June 8, 1894. It contains a detailed scheme for constructing a number of large storage reservoirs for impounding the water of the Usk and the Wye and several tribu-

taries, and bringing the water so collected to London by two aqueducts about 160 miles in length. The idea, it should be said, is not original, though the credit for the actual scheme belongs to Sir A. Binnie. At the time of the Duke of Richmond's Commission a great deal of attention had recently been drawn to the subject of the pollution of rivers, and the minds of engineers were much attracted by projects for obtaining water from mountainous watersheds, which had the double advantage of a far larger rainfall and less liability to pollution than lowland valleys. In fact, every possible upland source was passed under review, and among them were several sites in Wales at the head waters of various rivers, including the Wye. Of the plans submitted to the Commissioners several were pronounced practicable by them, but they preferred the London rivers as more reliable by reason of the underground sources which feed them in time of drought, whereas mountain streams depend almost entirely on the immediate rainfall, which is of an exceedingly irregular character. The Commissioners pointed out that during the exceptionally long drought of 1868 the Thames and Lea hardly diminished below the ordinary flow of dry years, on account of their large subterranean stores, and they laid great stress on the 'advantages of these rivers as sources of supply, which cause them to contrast so favourably with gravitation schemes.' In consequence of this pro-

nouncement the Welsh idea seems to have been abandoned for London until revived by Sir A. Binnie.

His complete scheme was to provide 415 million gallons a day in two instalments of about 200 millions each, the first to be obtained from the Usk and the second from the Wye, with a separate aqueduct for each. The total of 415 million gallons is equivalent to 420 millions which the Balfour Commission calculated as available from the existing sources, and as sufficient for a population of 12 millions. If, therefore, the Thames and Lea were abandoned altogether, and the Welsh supply took their place, there would still be available 67 million gallons from chalk wells in addition, making a total of 482 million gallons, which at 35 gallons per head would suffice for a population of 13,800,000, or down to the year 1945. The scheme, appears, therefore, as a complete alternative to the present supply ; it throws over both Royal Commissions, that of 1869 and that of 1893. The first reported directly against all similar schemes, including one which was almost identical ; and the second reported that the existing sources were in all respects adequate. Sir A. Binnie has consistently disagreed with both those bodies of experts, and has always advocated the abandonment of the Thames and Lea on the ground that the water supplied from them is 'more or less clarified sewage.' That is, indeed, the only ground on which their abandonment can be reasonably advocated.

But that ground has now itself been abandoned. The present scheme is quite different in principle. It proposes to retain both rivers so far as they are utilised at present, but to abandon them so far as getting any more water from them is concerned; and in lieu thereof to execute half the Welsh scheme. The latter is to be a supplementary, not an alternative, supply to the existing one. This of course involves giving up the plea of quality; we are to go on drinking the 'more or less clarified sewage' to the same extent as hitherto, and even a little more, though the additional water that may be introduced after the lapse of fifteen years will be from a purer source. The latter is not a very cogent plea for going to Wales, for if the present supply is safe enough to be retained, it is safe enough to go on with. In short, the ground has been shifted from quality to quantity. Probably Sir A. Binnie has not changed his personal opinion about the dangerous character of the London water, but the County Council have adopted a plan which is absolutely inconsistent with any genuine belief in the danger.

This change of attitude, whatever it may be due to, seems to have been adopted in 1896, when the Staines Reservoirs Bill was before Parliament; for in that year the County Council commissioned Sir Benjamin Baker and Mr. G. F. Deacon to examine the Staines scheme, and Sir A. Binnie's

Welsh scheme, and to report on them; and further—

to give their best advice to the Council, taking into consideration the whole of the circumstances of the case, as to whether or not it would be more advantageous to bring into London from the proposed Welsh sources than from the Thames the additional quantity of water over and above the quantity at present supplied which will be required for the supply of the population of $11\frac{1}{4}$ millions as estimated by the Royal Commission (*see* Appendix).

The two schemes are here definitely set over against each other, and two distinguished engineers are commissioned by the County Council to pronounce which is the 'more advantageous,' the one being the pet project of the County Council, and the other having just been fought tooth and nail by that body. Their report is dated April 1897. They devote seven pages to a searching criticism of the Staines scheme, and two and a half to a description of the Welsh scheme, of which they appear to have formed so favourable an opinion that not a single criticism was necessary. They preferred the Wye half to the Usk, as a first instalment, suggested cutting out a couple of reservoirs as superfluous, and reduced the estimated cost a little. Otherwise they approved of everything in the plans, and found no difficulty anywhere. But when we come to the crucial point—the verdict between the two schemes—we are disappointed to find that they declined to

pronounce one as engineers, except in respect of the relative cost, and that was in favour of the Staines scheme. For the rest they say—

Our opinion as engineers as to what would be the ‘more advantageous’ course to adopt is of course not worth more than that of others who are not engineers, but we have been asked to give our ‘best advice to the Council,’ and we therefore venture to make the following general remarks.

Of course even general remarks are welcome from gentlemen of so great ability and experience, but a verdict from them as engineers would have been still more valuable in the circumstances. They do say this, however, which comes within their professional sphere—that for ten or fifteen years the Thames must remain the chief source of supply; that it and probably the Lea will always be maintained as an alternative or contributory source (this knocks abandonment on the head); that there is no reason for entirely abandoning the present sources; and that the ‘practical question for decision is whether twelve to fifteen years hence the additional supply shall come from the Thames or from Wales.’ So far the engineer. Then, speaking as laymen, they state that in deciding the practical question ‘the personal prejudices and sentiments of the public,’ rather than the opinions of experts, are the most powerful factors; that personally they are in favour of getting the *additional* supply of water ‘as

far as possible' from Wales, and that the extra trouble and cost to the Londoner would be a trifle to what is incurred by country people. (For report, *see* Appendix.)

So they reach a favourable conclusion, and one can almost hear their sigh of relief. But if experts so obviously friendly and anxious to be agreeable can find no more than this to say, what a doubtful advantage the scheme must have, and what holes might not a hostile critic pick in it!

The plan now proposed by the County Council is substantially that recommended by Sir B. Baker and Mr. Deacon. Its main feature is the construction of four storage reservoirs, for impounding the waters of the Towy, Yrfon, Chivefri and Upper Wye respectively, and of an aqueduct for conveying the water so collected to London. The Yrfon reservoir is to be of great capacity, and upwards of six miles in length; it will receive the waters of the others as well as that of the river Yrfon, which is the largest of the four rivers. They are all mountain streams dependent on the immediate rainfall, and therefore constantly fluctuating between very wide limits. As every one knows, mountain streams come down in a flood after a few hours' heavy rain, and shrink up again with equal rapidity. A week's drought reduces them to insignificant proportions, and a month's to invisibility. The principle is, therefore, as Sir A. Binnie puts it, 'by storing up the bountiful supplies

of the wetter months to provide against the drier months of the year.' The essence of the whole scheme is storage; without it the rivers could not be depended on to yield a tenth part of the daily quantity required, sometimes for weeks together. And what is the principle of the Staines scheme? Exactly the same; it is to store the surplus water coming down the Thames in times of abundance against the times of scarcity. Hitherto this has not been done; the flow of the river is so large and so equable that it has not been necessary. We have been able to get our 130 million gallons at all times; but now that the demand begins to rise above that point, it becomes necessary to provide against dry periods by storing the surplus of wet ones. Such storage is now actually under construction to provide for an additional fifty-five millions, and on the same principle the Staines scheme proposes by gradually increasing the storage to provide eventually for 125 millions more, bringing the total up to 300 million gallons.

The question, therefore, is solely whether the 'additional' supplies shall be obtained by storing surplus Thames water or surplus Welsh water. The idea that the Thames is 'exhausted' is an entire delusion; the low state to which it fell last September has nothing whatever to do with the principle of the thing. If it had, the Welsh scheme would be put out of court at once, for those rivers

fell virtually to nothing at all at the same time ; nor is it known with any degree of certainty how far they can be relied on in more normal times. Doubtless they bring down enough water one season with another to supply the daily amount required *provided that the storage is large enough* ; but that applies with equal or greater force to the Thames, because we know by sufficiently exact observations, extended over a long series of years, that it brings down, one season with another, enough water to satisfy a far larger demand. We are contemplating 300 million gallons a day, but the average daily flow is 1,350 millions. Even when storm water is rejected, we have a large margin left. It is not considered necessary—indeed it would not be practicable—to reject storm water for the Welsh reservoirs ; but if it were, the quantity left available would be comparatively insignificant. The most convincing way of looking at it, however, is to compare the rainfall, which is of course the sole ultimate source of all fresh water. The basin of the Thames above the water intakes covers about 3,548 square miles, and the average annual rainfall is about twenty-seven inches ; the combined watersheds of the Welsh rivers in question are 170 square miles, according to the figures given on pages seven and eight of Sir A. Binnie's report, and the rainfall is reckoned at something like sixty inches. When all allowance has been made for the greater evaporation and

absorption in the Thames valley it is clear that the immense superiority of its area, which is twenty times larger than the other, must give a greatly superior yield—not less than four or five times as much. Yet it is proposed to draw 275 million gallons a day (215 for London and 64 compensation) from the 170 square miles in Wales; while the whole Staines scheme would only require 500 millions, or less than twice as much, from twenty times the area.

But it is unnecessary to argue the point any further, because no engineer has ever pretended for a moment that the required water cannot be got from the Thames. This is merely the contention of politicians. The engineers throughout speak of the schemes as alternatives. Nor has the experience of 1898 made the slightest difference in this respect. The Thames will continue to bring down its 1,350 million gallons a day one year with another as it has done before. The only difference imported into the question by the drought of 1898 is the necessity of allowing for a larger deficit at the worst. In other words, the storage must be somewhat enlarged, involving a corresponding increase in cost. That is all. The conclusions of the Balfour Commission stand exactly where they did; the scheme accepted by them is as feasible as ever, but rather more expensive than was then supposed by its authors. In other words, the question of going to Wales for

additional supplies is not one of necessity at all, but of expediency.

There are some things to be said for it and some against it. On the one hand, the water would be soft, and derived from sources less liable to pollution, though still requiring filtration. On the other, there is some doubt about the safety of soft water on account of its action upon lead, and there is the very serious disadvantage, on which the Duke of Richmond's Commission laid great stress, of being dependent on a single conduit 150 miles long and exposed to accidental or, still more, intentional interruptions. Sir A. Binnie argues that an enemy would have to be in possession of the whole country before being in a position to cut off the supply, and points to the cases of provincial towns, which derive their water from long distances with impunity. One may answer to that, that they have been compelled to do so, but London is not. The analogy, however, is imperfect; nor is the question one of an enemy in possession of the country so much as of an individual miscreant or foreign spy. What is to prevent an Irish American from blowing up the aqueduct at some vulnerable point and leaving London without half its water till the damage is repaired, to say nothing of flooding the country in the locality? Dynamiters never trouble about provincial towns; they always expend their energy upon the capital, where it makes more stir. The liability

to such a catastrophe is certainly to be considered when it is a matter of choice between two projects.

The most practical consideration, however, is the relative cost. I venture to think that in these matters 'the personal prejudices and sentiments of the public' by no manner of means outweigh the opinions of engineers, chemists and accountants, as Sir B. Baker and Mr. Deacon contend; unless, indeed, the prejudices and sentiments reside in the pocket. With the great mass of the public that is by far the most important consideration. They have always been more concerned about the rate than the quality of the water—and if they are told on high authority that a perfectly good and wholesome supply can be had a good deal cheaper than another supply, which is sentimentally preferable, the sentiment to which the latter appeals will immediately evaporate into thin air. The County Council are quite aware of this, of course, and accordingly they contend that the Welsh scheme is not only sentimentally preferable, but cheaper. That is Sir A. Binnie's estimate, but so far it has not been supported by any other engineer. The works proposed in the present Bills are set down to cost 17,000,000*l.*, but Mr. Walter Hunter and Mr. R. E. Middleton, who are the engineers for the Staines scheme, reckon that to bring the proposed 215 million gallons from Wales will cost from 35,000,000*l.* to 37,000,000*l.*, on the basis of the actual cost of the Manchester

(Thirlmere), the Liverpool (Vyrnwy), and Birmingham (Elan) works, which are all of a similar character. Their own plan for getting the same quantity of water from the Thames they reckon at 19,272,806*l.*, according to the revised calculations which take the conditions of 1898 into consideration. This is allowing for a minimum flow of 200 million gallons a day at Teddington; and as a good deal of stress has been laid upon this point, what has to be said about it may conveniently come here.

As we have already seen, the unprecedented condition of the river in 1898 has necessitated a revision of the estimates of storage required; it has also thrown some light on the question of how much water ought to be left in the river as a *minimum*. Hitherto 200 million gallons at Teddington weir have been taken as the standard. The amount was fixed in a rule of thumb sort of fashion by the Thames Conservancy, and it has been generally accepted, though Sir A. Binnie thinks it should be 250 millions, and other distinguished engineers have expressed the opinion that it might be reduced to 100 millions, and even to 10 millions without any injury. In September 1898 the flow fell to 77 millions, and what was the result? Gentlemen identified with the politics of the County Council pointed to the 'dangerous' condition of the river and the great detriment to public health that would be caused by the sewage 'oscillating' to and fro with

the tide if 'this state of things' went on. The inference was that more water ought to be allowed to come down the river to 'drive the sewage out to sea,' and therefore, that it is necessary to go to Wales. This is really part of the argument about the 'exhaustion' of the Thames, and not very convincing. In the first place, 'this state of things' means a drought which the records of eighty-three years cannot match. If it 'goes on'—a not very probable assumption—the Thames may indeed become offensive, but the Welsh rivers will certainly dry up altogether, so that it would not be much use betaking ourselves to them. In the second place, this dangerous and offensive sewage oscillating to and fro in the tideway is the sewage for which the County Council are themselves responsible. We have always been told that it is now treated so admirably as to be disposed of without any offence or injury to the river. Surely it is a libel on Sir A. Binnie's department to call his 'purified effluent' dangerous sewage oscillating in the tideway. Perhaps the sewage referred to is that which comes down from the upper river and is 'more or less clarified' by the filtration to which the companies subject it, before delivering it to the consumer; but in that case one does not see how it could drive itself out to sea, and would rather suppose that the less there is of it coming down to contaminate Sir A. Binnie's 'purified effluent' the better. Lastly, there

is no evidence of a dangerous state of things at all. On the contrary, if any conclusion is to be drawn from the experience, it is that the flow may be temporarily reduced below 100 million gallons without any ill effects whatever, and that the 200 million standard is quite unnecessarily high. Above the Richmond tidal weir, of course, it makes no difference, because the water is held up to a certain level. Below the weir it makes a difference at the end of the ebb tide, but that difference ceases to be observed—according to the Conservancy engineer—about Hammersmith, where the water coming down from above is absorbed into the immensely larger body of the tidal river.

The bearing of all this on the relative cost of the two schemes is that, if necessary, the minimum standard of 200 million gallons at Teddington might be lowered to 100 millions, in which case less storage would be required, and the cost of the complete Staines scheme reduced from 19,272,806*l.* to 15,500,000*l.* It is needless to say that Sir A. Binnie, for his part, reckons that the Staines scheme would cost vastly more than its authors believe. There is no reason in the face of it why the public should place more reliance on one side than on the other; both are equally interested in making out as good a case as possible, and certainly the warmest admirers of the County Council will hardly contend that accurate estimates have been hitherto among the

conspicuous merits of that body. An impartial and competent judgment on the question is obviously required. It is no doubt for that reason that Lord Llandaff's Commission have appointed an officer of the Royal Engineers as assistant Commissioner. Sensible people will await the result of the inquiry before making up their minds, and in doing so one more point should not be forgotten. The Staines scheme, being carried out by instalments, can be adjusted to the real requirements, which may turn out to be less than is anticipated. The population may not increase at the estimated rate at all, in which case part of the scheme might become unnecessary, and some millions be saved. But by far the most expensive item in the Welsh scheme—namely, the aqueduct—must be completed right off, whether it is eventually wanted or not. So much for the proposals of the County Council. It is only necessary to add that their Welsh scheme goes hand in hand with purchase, where again the chief considerations are financial, and still undergoing investigation at the hands of the Royal Commission.

With regard to the proposals of the water companies, one of the East London Bills has reference to the remoter future. It provides for a large increase of storage, and the remarks that have been made with regard to the Thames apply, *mutatis mutandis*, to the Lea. The average daily flow available for the East London Company is 100

million gallons in a series of sixteen years. In 1897 it was 105 million gallons. Allowing 30 millions a day for current use, the surplus of two months would provide 4,000 million gallons, or enough to carry through six months from storage alone without taking anything from the river. It is perfectly feasible to store even twice that amount. The present Bill seeks to construct two new reservoirs in addition to those authorised in 1897, in order to raise the storage from 2,000 to 3,000 million gallons. This will make the Company quite independent of the river for four months at a time. The principle is precisely that of the Welsh scheme. In fact the effect of 1898 so far as the East London Company is concerned has been to reduce the Lea from the position of a steady-going reliable river to that of a mountain stream, which runs away to nothing at times.

To construct these reservoirs will take some years, and meantime, unless something is done, the position of East London must remain unsafe. This is the really urgent question of the moment, and entirely separate from the Welsh or any similar schemes, which would not operate for many years. The existing communications made last autumn are obviously inadequate to guard against another breakdown, because the other companies concerned have little or no water to spare at the time of stress, under their present powers. The East London Company's second Bill and the conjoint Bill promoted by the

combined companies are intended to safeguard East London in the immediate future. Briefly, they provide for taking emergency water from the Thames, subject to the approval of the Local Government Board, and for carrying out an effective intercommunication scheme. Two alternative projects for doing this have been laid before the Royal Commission, which has already reported in favour of one of them. The County Council propose to do nothing in the matter except, of course, to take over the water supply themselves; but supposing they succeed it will be far too late to do anything for East London next summer. To establish efficient intercommunication will take some months; it is a lengthy, troublesome, and expensive business, and ought to be begun pretty soon if it is to be of use this year. The County Council are opposing the whole thing on the old ground that it would put the East London Company in a 'strong and stable' position and able to make better terms—in other words, it would ensure East London a full supply. That is quite sufficient reason why the Bills should pass; and it is the more necessary because the winter months have gone by without any approach to making good the standing deficiency of rainfall, and therefore the underground sources of water cannot be relied on in case next summer should be dry. It is quite on the cards that the scarcity may be greater in 1899 than in 1898.

CHAPTER XI

A SUGGESTION

THE formal adoption of the Welsh scheme as an integral part of the London County Council's programme has not improved the prospects of settlement by purchase. The financial difficulty was sufficiently great before, but it has now been increased, so far as the County Council are concerned, by the addition of an uncertain, but necessarily very large, amount. Had they left themselves open to choose the most economical plan of providing water for the future, there might have been some hope that, sobered by possession and responsibility, they would consult the interests of the community, and pay less attention to the voices of prejudice and personal ambition. The fact that they are now committed to a gigantic scheme, which has never even been submitted to a critical examination, cannot fail to increase the distrust with which their policy is regarded by a large section of the public, and particularly by the independent local authorities outside the County of London, but within the water area. The opposition of these bodies is quietly ignored in

the present proposals ; they are to make such terms as they can after the London County Council has entered into possession, or ' it will be lawful ' for them to bring in Bills to alter or amend the Act. As it is ' lawful ' for anybody to bring in a Bill to alter or amend any Act, their answer to this thoughtful provision will probably be, ' Thank you for nothing.' The plain truth is that they distrust the London County Council out and out, and several of them desire no alteration in the existing state of things. Their views have been laid before Lord Llandaff's Commission by accredited representatives, and may be summarised thus in their own words :

Middlesex County Council, with a mandate to represent all the minor local authorities affected.—' Purchase cannot possibly do us any good, and may do us a great deal of harm.'

Surrey County Council.—' It is not desirable that the water companies' undertakings should be purchased.'

Kent County Council.—' Content with matters as they are, and desire that the Kent Company should be left alone.'

Hertfordshire County Council.—' Purchase by the London County Council deleterious to the interests of the county, because they would be more inclined to abstract water than the companies.'

Essex County Council.—' Afraid of having the price increased in case of purchase—strong feeling to

prevent the London County Council coming over the border to take control.'

Croydon.—'Decidedly opposed to any single authority having any jurisdiction in our borough over the water supply.'

Richmond.—'What we want is to be left alone.'

Beckenham.—'Satisfied with the Kent Company, but not with the Lambeth—nevertheless, would almost prefer to stay as we are, to passing under the hands of either the London County Council or a Board for Water London.'

Dartford Urban Council.—'Perfectly content to remain in the hands of the Kent Company—object to the London County Council, as they would use local water for the rest of London.'

Dartford Rural Council.—'Prefer remaining in the hands of the Kent Company to having the company bought by the London County Council.'

Bromley Urban Council.—'Certainly prefer the supply being left as it is in the hands of the Kent Company.'

Bromley Rural Council.—'Certainly prefer the supply being left as it is in the hands of the Kent Company.'

West Ham.—'Not opposed to purchase if the London County Council would give them all they ask; otherwise they will resist it.' What they ask is to have all the wells in their district, and a large slice of the Lea handed over—an impossible proposal.

East Ham.—‘Wants to have the supply in its own hands.’

Leyton.—‘Would take water in bulk from the London County Council.’

Ilford, which is supplied by the East London and the South Essex Companies, prefers the water of the former as better and cheaper (this is interesting), and has some vague idea of getting the East London water into its own hands, through the London County Council, and so competing with the South Essex Company. This is totally impracticable for several reasons, and indicates a muddled state of mind.

The general jealousy and distrust of the London County Council here shown is striking. Not a single authority will consent to come under the wing, and only Leyton agrees to take water in bulk. Of the three plans proposed for dealing with these outside authorities—namely, severance, supply in bulk at a fixed price and control—there remains only the first; and if the complete severance of sources and distribution were practicable, it would meet some of the objections. But it is quite impracticable, except at a ruinous cost. Unless new works were constructed altogether, different authorities would have to share pumping engines and filter-beds—one-third part to this, one-fifth to that, and so on—an impossible state of things; while the adjustment of conflicting claims to the sources would occupy Parliament for

ever. And even then the localities that want no change at all would strenuously object. Clearly the desires of the London County Council can only be satisfied by subjecting others to an obnoxious yoke; and their opposition will be intensified by the proposal to spend 17,000,000*l.* on a new supply. They do not want water from Wales, and if they cannot trust the London County Council to deal fairly with them now, how much less when there is this enormous burden to be borne in addition.

Nor is it as though London itself were unanimous. Kensington has pronounced definitely against purchase, and other districts have opposed it through their Parliamentary representatives. This opposition will also be intensified by the adoption of the Welsh project. The ship was pretty heavily laden before; with such an addition to the cargo every sober man must ask himself whether it can possibly be seaworthy. In short, the new departure has made it more necessary than ever to wait for the result of the inquiry on the advisability of purchase. It is impossible that Parliament should stultify the Royal Commission which has been going on for upwards of a year, by settling the question beforehand over its head, and saddling the ratepayers with a financial burden which cannot be less than 50,000,000*l.*, and may turn out to be 70,000,000*l.* or more. When it has reported we shall know better how we stand. If the decision should be against

purchase no one will be much surprised, which is perhaps the reason why such a vigorous effort is being made to anticipate the result of the inquiry. Nor, it may be added, will any one be very sorry outside the circle of theoretical politicians, whose shibboleth is 'municipalisation.' The thing has been hanging on for years ; it has been tried this way and that ; Parliamentary history is strewn with the relics of one failure after another, because it has been found impossible to come to an agreement and to reconcile conflicting views and interests. Even the County Council and their progressive friends only want purchase on their own terms, and it may be confidently said that no one else wants it at all or, at any rate, is anxious about it. Probably the companies are a good deal more ready to be bought at a fair price than the ratepayers are to buy them.

And what, after all, is the object ? I have shown in a previous chapter that the campaign took its origin in the recommendation of the Duke of Richmond's Commission, which was endorsed by Sir William Harcourt's Committee in 1880, and has since been religiously repeated by one Committee after another, although all the solid advantages which were originally enumerated as reasons for public control have been attained without it. However, public control is one thing and purchase another. The latter was only suggested by Sir W. Harcourt's Committee as one out of three alternatives, and it

was mentioned last, whether purposely or not. The other alternatives were regulation and competition by means of a municipal supply. The latter has been abandoned as impracticable. There remains regulation; and while purchase is hanging in the balance with the odds against it, it is worth while considering whether regulation may not be a more natural, simpler, cheaper and equally satisfactory way of 'settling' the water question.

The reader is aware that the water companies are already regulated to a considerable extent by law, and are also subject to some current control at the hands of the Local Government Board. Personally, I think that control might be extended with advantage in at least two respects—(1) the sources of supply, and (2) the treatment of water before delivery. For instance, the Government ought to be able to intervene, if necessary, for the protection of the surrounding country districts whose own water supply is threatened by the limitless thirst of this monstrous collection of human beings, which we call London. The people of Hertfordshire, and to a less extent those of Kent, complain bitterly that London robs them of their water by sinking deep wells and pumping from them to such an extent that their own wells and springs run dry. This question was elaborately investigated and discussed by Lord Balfour's Commission. It is too intricate and theoretical to go into here at any

length, but we may say briefly that there are two theories about the water in the chalk—one, that it is like a cistern, and therefore that any pumping necessarily lowers all the wells and springs in the same watershed, whether they are higher up or not—the other, that the water is perpetually moving in the chalk towards the estuary of the Thames or the sea, and that consequently pumping from wells can only affect the level of the underground water in their immediate neighbourhood or lower down the valley. The former theory was supported by Sir John Evans, but the Commissioners decided against it. They recommended, however, that the quantity pumped from wells in the Lea valley should be limited, and that systematic observations should be kept of the level of the water in them. The latter does not appear to have been done ; and though the maximum quantity recommended has not been reached, it is clear that in such an exceptional season as 1898 the effect of pumping from wells ought at least to be very carefully watched, and if found to be prejudicial to the neighbourhood it should be liable to control by some higher authority acting in the general interests of the community.

Again, Government control with regard to sources might be usefully exercised in sanctioning or directing the abstraction of emergency water from the Thames for the benefit of any particular district, and generally in directing the interchange of supplies.

The benefit of this sort of regulation is sufficiently attested by the fact that the water companies are themselves asking to initiate it. Further, it might be desirable that the Government should direct recourse to new sources, as by the abandonment of wells, for instance. If ever a supply from Wales or some other distant source were to become necessary it could be provided for in this way,

With respect to control in the treatment of water before delivery, this also was made the subject of recommendations by the Balfour Commission. To some extent they have been carried out, but it is desirable that there should be uniform regulations with respect to subsidence storage, the formation and extent of filter-beds and the rate of filtration.

All these things are desirable in the public interest, and they would be just as necessary if the County Council were the authority as they are at present. Indeed, they would be more necessary, because there would be no one to keep watch over the County Council and bring it to book. It would be a most dangerous state of things to have the water supply like the Works Department, at the mercy of party politics and the electioneering exigencies of individual members. On the other hand, if the suggested control were vested in the Government, all the tangible advantages to be expected from a public authority would be secured.

What I suggest, therefore, is an amalgamation of

the companies with Government control of the sources and treatment of the water. By amalgamation I mean complete combination with regard to the provision and distribution of water. Three companies have already combined to carry out the first instalment of the Staines scheme, and the whole eight are now combining for an intercommunication scheme. Is there any reason why they should not combine altogether? This is an older plan for settling the question than purchase. It was proposed by the Government in 1851 as a remedy for the deterioration in the quality of the water, at that time caused by the increasing contamination of the tidal river. They proposed amalgamation of the companies with Government control of the sources. That seems to me by far the best proposal that has ever been made. It secures all that is really needed without creating any disturbance, exciting any hostile interests, or putting any burdens on the rate-payers.

But I would go a step further, and suggest a wider view of the water question. It is not merely a metropolitan but a national question, which is year by year becoming more troublesome and difficult. The season of 1898, and the fuss that has arisen in London, in consequence of it, are only aggravated symptoms of a standing and widespread trouble. In this country we have only a limited number of watersheds which can be depended on for an

abundant rainfall, and they are situated, where nature placed them, in hilly districts. The population, on the other hand, has gradually become massed together in great industrial centres in the lowlands, far from these watersheds. For a time their local sources of water suffice, but unless they happen to be on a great river like the Thames, which rises far off and drains a vast extent of country, they eventually outgrow their resources and have to look further afield. They cast their eyes on some more or less distant watershed, and then a struggle begins. Others put in a claim to the same ground, a contest ensues which is fought out in Parliament at the cost of enormous waste of time and money, and in the end some local interests are probably overlooked or trampled under foot. So it goes on in a haphazard fashion, the race for watersheds becoming more acute as needs increase and the available areas are taken up. The widespread scarcity of water in 1898 has intensified all this. I has brought into actuality the project of annexing 170 square miles in Wales for the benefit of London, partly for fear that some one else may be beforehand, and it has given a great impetus to the contest between some of the large Midland towns for the watershed of the Upper Derwent in Derbyshire.

The whole process is not only costly and uncertain, but it is the very negation of that principle of local government, on which the water supply of

each place is supposed to rest. When Manchester goes one hundred miles into Cumberland, Liverpool and Birmingham cross several counties to reach watersheds eighty miles off in Wales, and London proposes to do the same thing at double the distance, the essential idea of local government—that each shall manage its own affairs neither interfering nor being interfered with—is totally destroyed. Surely it is time to take a more comprehensive view of the situation and vest all the sources of water supply in the Government.

There is another reason, which was brought prominently forward as an urgent question of public health in connection with the disastrous outbreak of typhoid fever at Maidstone in the autumn of 1897. The problem of protecting gathering grounds and sources has ever since occupied the earnest attention of the sanitary world without any result. Mr. Chaplin endeavoured to deal with it to some extent by introducing provisions for that purpose into the water Bills which came before Parliament last session. But his attempt was frustrated on the ground that the matter ought to be the subject of a general statute. Now is the opportunity. The true solution is to make the sources of water supply, their distribution and protection, a department of Government.

It is not necessary to multiply departments or to add another burden to the already over-burdened

Local Government Board. This is a question of public health, and we have now two totally separate departments dealing with that subject—the medical side of the Local Government Board, and the Board of Agriculture, whose active functions are almost entirely confined to matters of public health in man and animals. Why not combine the two into a Ministry of Public Health, one of whose functions would be the distribution of the water supply, the protection of sources and the enforcement of adequate purification? This would solve the problem for London and all England at the same time.

CHRONOLOGICAL TABLE OF EVENTS IN THE HISTORY OF THE LONDON WATER SUPPLY

- 1582. London Bridge waterworks erected by Peter Morrys; the first power works known.
- 1613. New River Company brought water from Hertfordshire springs to the City.
- 1681. Shadwell Waterworks started. The Company obtained an Act of Parliament in 1691.
- 1723. Chelsea Company established by royal warrant to supply Westminster and Chelsea.
- 1785. Lambeth Company established by Act of Parliament to supply Lambeth 'and parts adjacent.'
- 1798. Grand Junction Canal Company obtained powers to supply Paddington, transferred in 1811 to Grand Junction Water Company.
- 1804. South London Company formed, afterwards Vauxhall Company.
- 1806. West Middlesex Company established by Act of Parliament to supply Kensington, Hammersmith, Fulham, Battersea, &c.
- 1807. East London Company formed to take over Shadwell works (1681) and West Ham works (1747).
- 1809. Kent Company incorporated by Act of Parliament to take over Ravensbourne waterworks, established in 1701 by royal warrant.

1821. Select Committee on the supply of water to the metropolis; reported material improvement in supply, 'experiment of competition' a failure: recommended statutory control of rates.
1828. Royal Commission: reported quality required improvement; recommended change of source.
1829. Sand filtration adopted by Chelsea Company.
1834. Southwark Company obtained Act of Incorporation; original works dated from 1771.
1845. Amalgamation of Southwark and Vauxhall (old South London) Companies.
1848. Lambeth Company obtained Act to move intake up to Long Ditton.
1851. Royal (chemical) Commission; approved of Thames as source, but recommended intakes above the tideway.
1852. Metropolis Water Act, after which all the Thames Companies moved up to Hampton and Molesey. Agreement with City Corporation as Conservators.
1856. Government Inquiry; reported favourably of action of Companies and of improvement effected.
1867. Royal Commission appointed to inquire into 'Water Supply,' Duke of Richmond chairman.
1869. Duke of Richmond's Commission 'reported': rejected all schemes for obtaining water from Wales and other mountainous districts, in favour of existing sources; recommended public control, improved filtration and purification of rivers.
1871. Metropolis Water Act; constant service introduced.
1880. Government Bill for purchase by Water Trust by agreement with Companies.
Select Committee (Sir W. Harcourt) reported against the terms of purchase agreed on; reaffirmed principle of public control.

1886. Fresh agreement with Thames Conservators to take more water.
1889. County Councils created.
1891. London Water Commission Bill (Corporation), Metropolis Water Supply Bill (Vestries), London County Council Bill.
All providing for transfer to public authority. Select Committee (Sir M. W. Ridley) recommended further inquiries to be conducted by London County Council.
1892. Royal Commission on 'Water Supply of the Metropolis' appointed, Lord Balfour chairman.
1893. Lord Balfour's Commission reported in favour of existing sources of supply as sufficient, with storage, for next forty years and a population of 12,000,000 at thirty-five gallons per head.
East London Water Bill rejected.
1895. Great frost.
London County Council's Purchase Bills introduced; Select Committee (Mr. D. Plunket) objected to arbitration clause; Bills suspended. First 'water famine' in East London.
1896. Lord James's Water Board Bill passed Second Reading in House of Lords; dropped in House of Commons.
London County Council's Purchase Bills re-introduced and rejected.
Staines Reservoirs Bill introduced by New River, Grand Junction and West Middlesex Companies; Select Committee (Sir J. Pease) passed Bill, but complained of difficulty of deciding on works proposed by Companies with purchase hanging in the air.
Second 'water famine' in East London.
1897. London County Council's Purchase Bills re-introduced and rejected.
Royal Commission appointed to inquire into the expediency of purchase or other ways of settling the question—Lord Llandaff chairman.

1898. Great drought.

Third 'water famine' in East London; connection made between mains of East London and Southwark and Vauxhall Companies through Thames subway; also between New River and Grand Junction Companies.

1899. New Purchase Bill, and scheme for bringing water from Wales promoted by London County Council.

Joint Bill providing for intercommunication and intersale brought in by water companies in combination.

APPENDIX

REPORT OF THE ROYAL COMMISSION AP- POINTED TO INQUIRE INTO THE WATER SUPPLY OF THE METROPOLIS, 1892-93

(LORD BALFOUR OF BURLEIGH, *Chairman*)

TERMS OF REFERENCE

WE, the Commissioners appointed by Your Majesty for the purpose of ascertaining whether the sources available within the watersheds of the Thames and Lea are adequate in quantity and quality for the water supply of the metropolis, humbly report as follows :—

1. The Commission issued by Your Majesty, and dated the 15th day of March, 1892, commanded us to ascertain, ‘Whether, taking into consideration the growth of the population of the metropolis and the districts within the limits of the Metropolitan water companies, and also the needs of the localities not supplied by any Metropolitan company, but within the watersheds of the Thames and the Lea, the present sources of supply of these companies are adequate in quantity and quality, and, if inadequate, whether such supply as may be required can be obtained within the watersheds referred to, having due regard to the claims

of the districts outside the metropolis, but within those watersheds, or will have to be obtained outside the watersheds of the Thames and the Lea.'

CONCLUSIONS AS TO FUTURE AVAILABLE SUPPLY WITHIN THE WATERSHEDS

132. We may now complete this section of our report by stating the conclusions we have arrived at on the question of quantity, as qualified by the terms of the reference.

From the River Thames.—In estimating the quantity of water which may be obtained from the Thames we have given full consideration to the topographical, meteorological, geological, statistical, and engineering evidence which has been laid before us by the representatives of all the parties, although we shall now quote figures only from a few of the proofs. The area within the Thames watershed down to Kingston was assumed by the Duke of Richmond's Commission (on evidence then received) to be 3,676 square miles, and this figure has been adopted by Mr. Hawksley, Mr. Baldwin Latham, and others in the present inquiry as the area down to Teddington Weir.

Both Mr. More and Mr. Binnie have made new and independent admeasurements, and compute this area respectively at 3,766 and 3,789 square miles, and as Mr. More (being engineer of the Thames Conservancy) may be assumed to possess the fullest acquaintance with the shed, we propose to adopt his figure. From Mr. Topley we accept 3,548 square miles as being approximately the area above the intakes of the water companies.

133. Mr. More has put in gaugings of the discharge of the Thames at Teddington for the nine years 1883 to 1891, which it will be convenient to reprint here, with an

added column showing the rainfall, for easy reference in the calculations which are to follow:—

Year	Total quantity of water abstracted by the Water Companies	Volume of Discharge at Teddington Weir, as gauged by Thames Conservancy	Total flow of the River Thames. Col. 2 + Col. 3	Average annual rainfall on Thames Basin, above the Intakes of the Metropolitan Water Companies
1	2 Gallons	3 Gallons	4 Gallons	5 Inches
1883	26,197,000,000	659,657,000,000	685,854,000,000	28.41
1884	29,916,000,000	330,648,000,000	360,594,000,000	22.90
1885	29,654,000,000	399,130,000,000	428,784,000,000	29.15
1886	30,350,000,000	541,786,000,000	575,136,000,000	31.07
1887	32,154,000,000	390,296,000,000	422,450,000,000	21.32
1888	30,280,000,000	127,656,000,000	457,936,000,000	28.45
1889	31,419,000,000	337,059,000,000	468,478,000,000	25.61
1890	32,876,000,000	261,916,000,000	294,792,000,000	22.81
1891	35,185,000,000	472,228,000,000	507,413,000,000	33.31
Totals	278,061,000,000	3,923,376,000,000	4,201,437,000,000	213.06
Average of the above 9 years	30,896,000,000	435,931,000,000	466,827,000,000	27.01

In the third column of this table the average yearly discharge of the nine years at Teddington is given as 435,931 million gallons. But this quantity is subject to some correction, for we found on investigating the details of the gauging arrangements at Teddington that it was desirable to check the results by simultaneous measurements at Molesey and Sunbury weirs, and having entrusted this work to Mr. Middleton and considered his report, we accept his opinion that Mr. More's quantities should be increased by 7 per cent.

To the	435,931,000,000 gallons
we therefore add	30,515,170,000 „
making	466,446,170,000 „
and again to this must be added	
the average quantity taken by	
the companies, viz. :—	30,896,000,000 „
giving a grand total of	497,342,170,000 gallons

Divided by 365 this gives a daily average of 1,362,581,288 gallons.

But during the nine years in question the rainfall averaged only 27·01 inches as compared with 28·50, which Mr. Symons gives as the mean fall of a long term upon the watershed. We therefore increase the daily volume to 1,437,747,750 gallons, raising it in the ratio of 27·01 to 28·50. This quantity must, however, be reduced in the proportion of the area above Teddington, viz., 3,766 square miles, to that above the intakes, which is 3,548 square miles, thus bringing down the net daily quantity to 1,354,521,778 gallons.

This, we believe, is a very close approximation to the average daily flow of the Thames down to the waterworks intakes during a long series of years, and we will call it in round figures 1,350 million gallons. The average daily discharge of three consecutive dry years we estimate at 1,120 million gallons, and of the driest year at 900 million gallons.

134. These being the facts, we are of opinion that by the construction in the neighbourhood of Staines of reservoirs of adequate capacity into which water shall be pumped and stored in times of excess, to be used in times of deficiency, at least 300 million gallons a day may be obtained for the supply of London. We believe this can be done without taking in the more turbid of the flood waters, and without injuriously diminishing the volume of the river below the point of abstraction. To ensure the best results in both these respects the taking of the water should be subject to strict regulations laid down by Parliament.

The water allowed to be taken from the river should, in our opinion, include any water which may be pumped from the gravel beds in the vicinity of the river.

135. *From the River Lea.*—The available drainage area of the Lea above the lower intake of the East

London Company is stated by Mr. Bryan to be 460 square miles, and the mean rainfall upon it is stated by Mr. Symons to be 26 inches. No gaugings of the discharge have ever been made at or below the intakes, but they have been kept for many years at Feilde's Weir, which has above it (as before stated) an area of 422 square miles. From this area we have made out that on the average of three consecutive dry years 81 million gallons a day will flow off by the river.

We have had no definite evidence as to the capability of the district *below*, but from some remarks of Mr. Bryan's we judge that he does not calculate upon getting an additional quantity proportional to the whole area, and we shall probably be safe in calling the total available quantity 85 million gallons. Of this the New River Company draw $22\frac{1}{2}$ millions direct from the river above Ware, and the East London Company have at times drawn 37 millions, but in their statement set out in paragraph 88 they claim to take only 30. Dealing with the river as a whole, this abstraction is, in our opinion, too great with the storage now in existence, but if other reservoirs were constructed adequately increasing the storage capacity on well recognised lines, the taking of $52\frac{1}{2}$ million gallons a day may be continued.

The taking of the water should be under regulations similar in character to those suggested for the Thames, viz. : the first flush of floods to be rejected, and in dry weather no water to be abstracted when the flow has run down to a quantity hereafter to be determined.

136. *From Wells in the Lea Valley.*—Into this part of the case we have already gone very fully, and we need only repeat here that in very dry years the companies should not calculate on obtaining more than 40 million gallons a day.

137. *From the Chalk on the South Side of the Thames.*—From the existing wells of the Kent Company and others

which may be sunk within their district, we think that $27\frac{1}{2}$ million gallons a day may safely be taken.

From the tract of chalk country in the valley of the Medway and the larger area further eastwards to the coast, a very considerable addition is also undoubtedly procurable.

138. The summary of the several quantities above stated is as follows :—

	Millions of gallons per day
From the River Thames	300
From the River Lea	$52\frac{1}{2}$
From wells in the Lea Valley	40
From wells in the Kent Company's district	$27\frac{1}{2}$
Total	420

sufficient at 35 gallons per head per day for a population of 12 millions.

CONCLUSIONS AS TO QUANTITY AND QUALITY

178. We are strongly of opinion that the water, as supplied to the consumer in London, is of a very high standard of excellence and of purity, and that it is suitable in quality for all household purposes. We are well aware that a certain prejudice exists against the use of drinking water derived from the Thames and the Lea, because these rivers are liable to pollution, however perfect the subsequent purification either by natural or artificial means may be ; but having regard to the experience of London during the last thirty years, and to evidence given to us on the subject, we do not believe that any danger exists of the spread of disease by the use of this water, provided that there is adequate storage, and that the water is efficiently filtered before delivery to the consumers.

179. With respect to the quantity of water which can be obtained within the watersheds of the Thames and the Lea, we are of opinion that, if the proposals we have recommended are adopted, a sufficient supply to meet the wants of the metropolis for a long time to come may be found without any prejudice to the claims or material injury to the interests of any districts outside the area of Greater London.

180. We are of opinion that an average daily supply of 40 millions of gallons can be obtained from wells and springs in the chalk of the Lea valley without affecting any material interests; but that, if that quantity is exceeded, it is probable that the springs and wells in the parts of the valley immediately adjacent to the wells, and all the districts further down the valley, may be injuriously affected.

From wells in the chalk area on the south side of the Thames, in the district of the Kent Company, we are of opinion that a daily average supply of $27\frac{1}{2}$ millions of gallons may be obtained.

We think it of very great importance that distinct obligations should be laid upon any company or local authority which is allowed to pump water from the chalk for purposes of public supply, to keep accurate observation of the effect of their operations on the level of the water in the wells from which they pump, and return the results to the water examiner under such regulations as may be framed. The great difficulty which we have had to encounter has been in getting accurate and reliable information as to the actual effect of the operations now carried on. The importance of procuring this will increase each year as the limit of what can be taken from any district with safety is gradually being reached.

181. From the river Lea we are of opinion that, with adequate additions to the present system of storage, $52\frac{1}{2}$ millions of gallons may be taken daily.

182. We are of opinion that by the construction of storage reservoirs in the Thames valley, at no great distance above the intakes of the companies, it will be possible to obtain an average daily supply of 300 millions of gallons without taking in any objectionable part of the flood-water.

The average daily flow of the Thames at Teddington Weir, adding the water taken by the companies, is about 1,350 millions of gallons per day. It will thus be seen that when 300 millions of gallons are taken there will be left to flow down into the tidal portion of the river an average daily quantity of not less than 1,000 millions of gallons; and we think that regulations could be framed under which the quantity we suggest could be taken not only without reducing the flow of the river on the rare occasions of exceptional drought to the present minimum, but in such a way as to secure that the volume of water left in the river at these times would be substantially greater than it is under existing conditions.

To our minds, one great advantage of such a scheme of storage reservoirs is that it can be carried out progressively to meet the increasing demands for water, and should the population not grow so rapidly as we have thought it right to contemplate, the extensions may be from time to time deferred as successive decennial enumerations reveal that the ratio of increase is remaining stationary, or even falling.

183. From the sources and by the methods we have mentioned, a daily supply of 420 million gallons can, in our opinion, be obtained. This is a sufficient quantity to supply 35 gallons a head to a population of 12 million persons, which is about three-quarters of a million in excess of what the total population of Greater London, together with the outlying parts of Water London, will have become in 1931, even if the ratio of increase in

the decennial period from 1881 to 1891 is fully maintained.

184. We are further of opinion that a large supply of water might be obtained from the chalk area east of the Kent Company's district, in the basin of the Medway, and in the district further east without any risk whatever of damage to that area.

All which we humbly submit to Your Majesty's gracious consideration.

BALFOUR OF BURLEIGH, *Chairman*.

GEORGE B. BRUCE.

ARCH. GEIKIE.

JAMES DEWAR.

GEORGE H. HILL.

JAS. MANSERGH.

WILLIAM OGLE.

FRANCIS GASKELL, *Secretary*,

September 8, 1893.

LOCAL GOVERNMENT BOARD REPORT ON THE ALLEGED FAILURE OF THE EAST LONDON WATER SUPPLY IN THE SUMMER OF 1895

THE THEORY OF SHATTERED MAINS

The charge made on the part of the London County Council, that the failure of the East London Water Company to give their consumers a constant service supply during July and August was due to the non-repair of the shattered mains of the company, was supported by

evidence given by Mr. Binnie, the chief engineer of the London County Council.

This theory of Mr. Binnie's, that the loss of water during the drought of July and August was due to shattered mains of the water company, was not, in our opinion, proved at the inquiry, nor supported by other witnesses called on behalf of the vestries. We have already referred to the fact that the company admitted that a number of their mains had been fractured during the winter frost, and also to the fact that these mains had not been all repaired until the middle of April. There is no doubt in our minds that the increased waste over the ordinary supply of the company, shown in Mr. Binnie's table, as regards February, March, and April, was largely due to the escape of water from the fractured mains of the company as well as from the fractured communication pipes, for, from Mr. Binnie's second table, it would appear that there was a diminution, in May, in the excess of the supply pumped into the district, amounting to upwards of 50 million gallons, when compared with the excess in each of the three previous months. It is further to be noted that all the company's reservoirs were full on May 26, so that the fact that an excess of water was pumped into the district prior to that date cannot be regarded as having any bearing on the subsequent scarcity. It is, however, clear from Mr. Binnie's figures that an excess of water, amounting to 213 million gallons, or less than five days' supply, had been pumped into the district in the month of June. Where that water was drawn from will have to be considered when we deal with the evidence given by the water company in their defence.

Finally, evidence was given on behalf of the company, to the effect that although it had not been necessary to repair any mains belonging to the company after the middle of April, and although the constant service supply

had been resumed throughout the district since September 8, the daily delivery of water during September did not exceed the normal average, an amount equivalent to about thirty-five gallons per head of the population.

In our view these facts prove that the scarcity in July and August was not to be accounted for in the manner suggested by Mr. Binnie.

THE DROUGHT

Evidence with respect to the alleged unprecedented drought was given on behalf of the water company by Mr. Symons, F.R.S., the secretary of the Royal Meteorological Society, and by Mr. Bryan.

Mr. Symons proved that in the watershed of the river Lea the first six months of 1895 was a period of most unusual drought; that at two out of the three stations which supply the meteorological observations for this area the rainfall during that period was the smallest recorded during the thirty years over which continuous observations have been made, that indeed the actual rainfall recorded at the three stations for the first six months of 1895 amounted respectively to only 48 per cent., 67 per cent., and 52 per cent. of the average of the last thirty years.

Mr. Symons further stated that although for shorter periods, such as three months, there had been times of greater drought in 1870 and 1893 than in 1895, the longer period of six months would have a greater effect on the discharge of the river, and for this length of time no such scant rainfall had ever been recorded in the watershed of the river Lea as that of 1895.

The evidence of Mr. Symons with regard to the exceptionally small rainfall in the Lea valley during the first six months of 1895 was corroborated by Mr. Bryan, who

gave, in addition, evidence with respect to the effect of the drought on the discharge of the river. He showed that on May 26 the discharge of the river Lea was 43,209,000 gallons, whereas on the following day, May 27, the discharge fell off 10 million gallons, and continued to decrease steadily until the middle of July. The average daily discharge of the river throughout the month of June was only 24,300,000 gallons, and by July 13 it had decreased to 22 million gallons.

We may here note that the average draw from the river Lea is 57,900,000 gallons a day, namely, 30 million gallons by the East London Water Company, 22½ million by the New River Water Company, and 5,400,000 by the Lea Conservancy Board for navigation purposes. In view of the decrease noticed above, it is clear that the demand that must have been made during this season of drought on the storage resources of the water company was very great indeed. As a matter of fact, as has already been observed, the storage reservoirs of the company had become half emptied by June 28, and it was only by placing the greater part of their district on the intermittent system that the company were able to avoid a catastrophe.

MEANS OF STORAGE INSUFFICIENT, OWING TO THE REJECTION OF A BILL PROMOTED BY THE COMPANY IN PARLIAMENT IN 1893

The question of the amount of storage required by the East London Water Company was very fully gone into before the Royal Commission on Metropolitan Water Supply, and in order to make the subject quite clear here, it is necessary to explain that although the East London Water Company has larger storage than any of the other London water companies, having, in fact, storage equal to about 15 days' supply to their district, compared with 14·2 days' supply in the case of the Chelsea Company,

and stores varying from 7 days to 1·8 days only in the case of the other London water companies, their position is entirely different from that of companies drawing their principal supplies from the Thames. The discharge of the Thames being always sufficient to meet the draw on it, the water companies, having ample power to procure a supply from that source, need storage merely to tide them over any temporary breakdown of machinery or appliances which may occur. The discharge of the Lea, on the other hand, though at times in excess of the draw on it, is liable at other times to fall very short of the demand on it, as, for example, this year, and, as a consequence, the East London Water Company require large storage to equalise, in a measure, the flow of the river. For this reason the Royal Commissioners, when referring in their report to the capabilities of the different companies, are careful to add, in the case of the East London Company's take from the River Lea, the words 'with storage reservoirs'—a proviso not necessary to allude to in the case of the other companies.

The available capacity of the existing storage reservoirs of the company amounts to 741 million gallons, and evidence was given on behalf of the company to the effect that for several years past the company had felt the danger of the insufficiency of their present storage; that in 1890 they were so convinced of the necessity and urgency of increasing that storage, that they at once began to take steps to do so; that by the end of 1891 they had found a site for the necessary reservoirs, and had completed negotiations for the purchase of a lease in perpetuity of ninety acres of land, and that shortly afterwards they obtained six acres more, and that in the autumn of 1892 they had made all their arrangements and came to Parliament for a Bill to enable them to carry out the works. That Bill, as is well known, was thrown out by Parliament at the second reading, and a

large amount of evidence was brought forward, and a number of documents were put in, to show the action of the London County Council with regard to this Bill, both in 1893 and 1894; but we do not propose to go into the merits of the case that the water company bring against the London County Council. We content ourselves with the remark that events have justified the demands of the company for more storage and more pumping power, and after the speech made in the House of Commons by Mr. Mellor, the Chairman of Ways and Means, in which he said that the House would 'incur considerable responsibility' if it refused to send the Bill to a Committee, the responsibility for the want of this storage in 1895 cannot justly be saddled upon the water company. In the evidence given by Mr. Bryan, the failure of the water company to maintain their constant service supply this year was attributed to the unprecedented drought in the Lea valley and the consequent small discharge of the river; but he stated that had the company obtained their Bill in 1893, they would by the middle of January this year have had 200 million gallons additional storage at the Racecourse reservoir, as well as additional pumping power capable of raising from the chalk 3 million gallons a day, and with these they could have maintained their constant service, and the drought would not have been felt by their consumers.

Our inspection of the works of the company, commenced since the passing of their Act in 1894, satisfied us that Mr. Bryan was justified in his statement that the enlargement of the capacity of the Racecourse reservoir, giving 200 million gallons more storage, and the provision of additional pumping power capable of raising 3 million gallons a day, could have been completed in January 1895 had the Bill of 1893 passed.

In support of the contention of the company, that notwithstanding the intermissions in their water service,

little or no inconvenience would have been experienced by the consumers if they had been provided with sufficient means of domestic storage, two witnesses were called, one of whom was the owner of some fifty houses in Walthamstow, and the other an estate agent, who had the management of 409 houses situate in nine different districts supplied by this water company. Both witnesses gave evidence to the effect that the houses referred to had cisterns, and that throughout the interruption of the constant service not a single complaint had been received from any one of the occupiers. Evidence was also given by Mr. Bryan to the effect that, under the ordinary pressure of the water in the East London district, a $\frac{1}{2}$ -inch pipe would discharge enough water to fill a 50-gallon cistern in less than a quarter of an hour.

From a consideration of the evidence that was brought before us, we are of opinion that the necessity of suspending the constant supply service in the Metropolitan area comprised in the district of the East London Water Company, and in the district of the Leyton Urban District Council, was forced on the water company by the unprecedented drought in the Lea valley during the first six months of this year (1895), following on an unusually long and severe frost, which had caused such extensive fractures to lead pipes that they could not be repaired fast enough to prevent exceptional waste of water. Further, that the East London Water Company were hampered in dealing with the above difficulties by the want of the additional storage and pumping power that their Bill of 1893 would have given them had it passed into law at that time.

We would also note under this heading that in our opinion the inconvenience experienced by consumers was much aggravated by the want of proper means of domestic storage.

CISTERNS

Incidentally we would here refer to the advantage to the consumer of having a small storage of water in every house. It was shown that, throughout this scarcity, persons occupying houses provided with cisterns suffered no inconvenience. No doubt ill-designed and badly-placed house cisterns are open to objection from a health point of view; and nothing could be further from our intention than to advocate any return to the old defective cisterns with their movable wooden covers; but we do advocate the provision of properly designed cisterns. By a properly designed cistern we mean a cistern which should be so constructed as to exclude alike the possibility of the entrance of dirt from the atmosphere and the accumulation of any deposit from the water itself, whilst at the same time the water in the cistern is under the same pressure as the water in the main itself; in other words, the cistern that would satisfy us is merely a local enlargement of the water main. Such a cistern is, in our opinion, subject to none of the objections commonly urged against the use of cisterns. Under the best arrangements there must be times when short periods of interruption of a constant service will occur, and at such times the want of water for domestic purposes, for flushing waterclosets, sealing water traps, &c., is calculated to lead to conditions injurious to health, which should not be allowed to exist, and which a proper use of really efficient cisterns would guard against.

With respect to the contention advanced on behalf of the vestries, that the real remedy for the defects in the water company's arrangements which resulted in the scarcity of the water supply in East London during July and August 1895, is to be found in sweeping away the water companies altogether, and transferring all their works to the hands of a public authority, we think that

the question thus raised is not one for us to consider here, and that it does not come within the scope of this inquiry.

CONCLUSIONS

In conclusion, we may briefly summarise the results of our consideration of the evidence placed before us in this inquiry.

I. That the scarcity of water in the East London Water Company's area during the summer of 1895 was due to the following causes :—

- (a.) Exceptional waste, beyond the undue waste of ordinary years, of water, owing (1) to non-repair of fractures in the consumers' pipes brought about during the unusually long and severe frost of the previous winter, and (2) to excessive garden watering during the drought in May and June.
- (b.) Decrease in the volume of the river Lea due to the unprecedented drought which occurred during the first six months of 1895.
- (c.) Means of storage possessed by the East London Water Company inadequate to enable them to meet the combined waste and deficiency of water noted under headings (a) and (b).

We would also note under this heading that in our opinion the inconvenience experienced by consumers was much aggravated by the want of proper means for domestic storage of water.

REPORT ON AVAILABLE SOURCES OF
WATER SUPPLY FOR LONDONBY A. R. BINNIE, *Chief Engineer to the London County
Council*

'That the chief engineer be instructed to report on the site and yield of other sources of water supply, and as to the method which might be adopted for storing and conveying water to London, with estimates of cost.'—*Water Committee, February 16, 1894.*

INTRODUCTION AND GENERAL

It will be within the remembrance of the Committee and those who have studied the recent inquiry of the Royal Commission on water supply, that the Thames basin down to the intakes of the water companies comprises an area of about 3,542½ square miles, containing a present population of upwards of a million persons, and that upon this area the rainfall varies probably from 24 up to 30 or 32 inches, averaging possibly about 27 inches per annum.

This is the total average rainfall of many years, making no allowance for long periods of dry weather or years of extreme drought; and the Royal Commissioners have stated that with a certain but undefined storage they consider that 300 million gallons a day can be obtained from the Thames, provided that certain important works of sanitation and regulation are undertaken, and that the storage provided be made sufficient to avoid the necessity of drawing on the river in periods of flood or of extreme drought.

It will also have been observed that the water from the river will first have to be pumped into the reservoirs, where it will subside and be stored, and after filtration will again require to be pumped for the supply of the metropolis.

It must also be borne in mind that the investigations of the recent Royal Commission under Lord Balfour of Burleigh were directed not to inquire into what was the best and cheapest possible scheme for the supply of London, but as to what were the capabilities of the Thames and Lea valleys for the purposes of the metropolis, and the decision at which they have arrived, limited as it is by the very serious restrictions which they say should be enforced to secure the purity of the water and to prevent the depletion of the river, may be considered as the best that can be said for the Thames and Lea valleys, irrespective of other sources of supply more or less distant from London ; and one impression, I think, must be left upon the mind of the reader of that report, namely, that under any circumstances the consideration of some enlarged scheme of water supply must be undertaken within the next twenty years, as the valleys of the Thames and Lea become more thickly populated, and the sources spoken of by the Royal Commissioners approach exhaustion.

I hope to be able to point out in what follows that by resorting to a district of greater rainfall a much smaller area than the above will suffice for the purposes of Metropolitan supply, while giving ample compensation in water to the streams from which it is abstracted, and that the works can be constructed at such an altitude as entirely to avoid pumping, except for the small areas on the summits of Hampstead, Highgate, Shooter's Hill, and the Sydenham hills.

In laying out such a scheme regard must be had, even

in a district of large rainfall, to the incidence of the fall during the wetter months of the year, so that by storing up the bountiful supplies of the wetter months we shall be able to provide against the drier months of the year in such a manner as to ensure both to the metropolis and to the streams from which water is derived a certain instead of a fluctuating flow, which at present in all cases takes place in the state of nature, the result being that the great bulk of the rainfall passes from the ground in the form of floods during the wet months not only in a useless, but often in a very harmful manner to the valleys below; for it must be remembered that water flowing from hilly and mountainous ground passes off with much greater rapidity after a fall of rain or the melting of snow upon the hills than it does in the Thames valley.

GENERAL DESCRIPTION OF SOURCES OF SUPPLY

The sources of supply to which I propose to direct attention are situated at altitudes above 600 feet, extending to 2,800 feet, above the sea level at the head waters of the rivers Usk, Wye and Towy, in the counties of Cardigan, Brecon, Radnor, and Montgomery.

The areas from which the water would be derived are composed of the impermeable beds of the primary rocks of the old Red Sandstone and Silurian systems, which are noted for the purity of the water which flows from their slopes.

Owing to the general altitude of these districts, on the steep slopes of the surrounding hills, arable cultivation is almost impossible, the lower portions being chiefly composed of mountain pastures running up into bare unculturable wastes, with but a sparse population in any part.

On these high lands, situated as they are near the

western seaboard, the rainfall, as compared with that of the Thames valley (27 inches), is very heavy, varying from 45 inches up to 75 inches or more per annum; consequently from a total area of 312,400 acres, or 488 square miles, 415 million gallons a day can be obtained, after making full allowance for dry years and evaporation, and giving due compensation in water to the streams and rivers from which the supply is derived, as compared with 300 million gallons a day without compensation from the 3,542 square miles in the Thames valley above Molesey.

The altitude and contour of the valleys also is such as to permit of the water being stored in economical reservoirs, and flowing by gravitation into service reservoirs situated at an altitude of about 300 feet above the sea in the neighbourhood of London, so that pumping at the source or for the general supply of the metropolis is unnecessary.

The scheme of works which I propose to lay before you may for the purposes of description be divided into five main sources, namely:

(1) The valley of the Usk.

(2) The Yrfon, a tributary of the river Wye, combined with the upper sources of the river Towy.

(3) The Edw, another tributary of the Wye.

(4) The river Ithon, which ultimately flows into the Wye; and

(5) The upper portions of the Wye itself.

	Million gallons per day.
(1) The Usk and Llangorse areas	182
(2) The Yrfon and Towy sources	135
(3) The Edw	18
(4) The Ithon	37
(5) The Upper Wye	43
A total of	415 million gallons.

Assuming that the Thames and Lea were entirely abandoned as sources of supply for London, we should have left as available uncontaminated sources the chalk wells in the Lea valley and those of the Kent Company.

The Royal Commissioners have given it as their opinion that from the Lea valley 40 million gallons per day can be obtained, and no doubt if pumping from the river be abandoned this in all probability would be the case. From the chalk wells of the Kent Company they estimate a yield of 27 million gallons a day. If we now add these 67 millions from the chalk wells to the 415 million gallons available in Wales, we obtain a total possible volume of 482 million gallons a day, which, at the rate of 35 gallons per head per day, would afford a supply to a population of nearly 13,800,000 persons, which would probably be the population of the districts now supplied by the various water companies in the year 1945.

Among the works above proposed the construction of the large reservoirs suggested is the most characteristic feature.

Undoubtedly two of them, that at Llangorse and that on the river Yrfon, would be the largest ever constructed in this country.

The following table (p. 213) is inserted for the purpose of summarising the facts as to the details of the various reservoirs.

DISPOSAL OF THE AVAILABLE SOURCES OF SUPPLY

As it is clear that the metropolis does not yet require so large a supply as that which can be obtained in Wales, and as it is important so to lay out the works that they can be gradually extended as time goes on, we have to look to the most economical arrangement

TABLE F

Watershed	Catchment areas, including those for compensation		Reservoirs				Dams		Daily Supply for London
	1	2	3	Available capacity	Top water level	Top water area	Ex- treme height	Length	
		Acre	Square miles		4	5	6	7	8	9
					Million gallons ord. datum	Acre	Feet	Feet	Million gallons
1. Usk and Llangorse	136,000	212.5		Usk (compensation)	733	530	120	2,250	182
				(Llangorse . . .)	595	2,800	130	2,500	
2. Yrfon and Towy	102,600	160.3		Yrfon . . .	606	2,850	166	4,750	135
				(Towy (compensation))	580	210	130	750	
3. Edw . . .	17,000	26.5			700	570	80	730	18
4. Ithon . . .	34,800	54.4		Ithon . . .	900	900	120	1,350	37
				(Clywedog (compensation))	800	240	90	1,100	
5. Upper Wye . .	22,000	34.4			900	900	130	1,100	43
					10,500				
	312,400	488							415

for availing ourselves of the bountiful supply above spoken of.

In connection with this, and considering the importance before mentioned of preserving in the future two independent lines of communication, we can at once divide the above sources into two portions of approximately 200 million gallons a day each.

One of these portions would include the Llangorse and Usk with the Edw supplies. These yield respectively 182 and 18 million gallons, a total of 200 million gallons a day. The second division would include the Yrfon and Towey supplies 135 millions, the Ithon 37 millions, and the Upper Wye 43 millions, or a total of 215 million gallons per day.

When I come in a later portion of this report to speak of the aqueduct which will convey the water to London, it will be found that I propose to form this in two channels, each of a capacity of about 200 million gallons a day.

Therefore we may for the purposes of this part of the report divide the scheme into the two portions above spoken of, namely, the Usk, Llangorse, and Edw, and the Yrfon, Towey, Ithon, and the Upper Wye.

But as a preliminary in carrying out the earlier portion of the scheme, it might suffice to take in as a first instalment the Upper Usk and Llangorse, leaving the Edw to be added when time requires.

In the same way in constructing the second portion of the scheme, embracing the Yrfon, Towy, Ithon, and Upper Wye areas, the Yrfon reservoir could first be constructed, with which the supply from the Towy could be brought in. This when exhausted could be supplemented from the Ithon, and ultimately the Upper Wye source could be rendered available. As indicated upon the map, advantage will be taken of the great benefit that is derived from decanting one reservoir into

another so as to ensure a due settlement to the largest possible extent by causing the Upper Wye reservoir, the top water level of which is 900 feet, to discharge into the Yrfon reservoir, the top water level of which would be 606 feet.

In like manner the reservoir on the Ithon would discharge into the reservoir on the Edw.

The first section of the main conduit to London would start from Llangorse; the main conduit for the second section would start from the reservoir on the Yrfon.

By the above scheme I think I have laid out the works with the greatest economy, having regard to the gradual utilisation of the various sources already described.

FILTER BEDS

Although it will be seen from the chemist's analyses of the waters of the Usk, the Yrfon, the Towy, the Wye, &c., that the waters in their natural state are of greater purity and contain less solid matter than the London water after filtration, and although these waters will be stored and be subjected to subsidence in the large reservoirs which I have described, and in some cases will be decanted or drawn off from one reservoir into another, yet I consider that when all precautions are taken the water should be filtered before delivery to the consumer. Possibly this filtration may not be of so severe a kind as that required by the waters of the Thames, flowing as they do from a richly cultivated and inhabited area, yet small particles of floating matter may fall into the waters so that I think the result would be the filters would require much less attention and cleansing than in the case of the Thames, while the advantage of a pure, clean water free from every particle of suspended matter would be secured.

ESTIMATED COST OF WORKS

This is a subject which has engaged my most careful attention ; and assisted as I have been by Mr. Hassard, M.Inst.C.E., and Mr. Deacon, M.Inst.C.E., the engineer of the Liverpool Waterworks (Vyrnwy Supply), I believe that I have arrived at figures which can be relied upon. They have been based upon prices actually paid for recent work of a similar nature, and when it is considered that after making full allowance for actual construction I have provided a sum exceeding 5,000,000*l.* to cover unforeseen contingencies, parliamentary and professional charges, I believe that if anything the cost, on further working out, or in actual construction, would be reduced in amount.

As a total for the gross supply of 415 million gallons a day to provide for all contingencies for a period of 50 or 60 years hence, the summary of my estimate would be as follows :

Summary estimate of total

Head works at Llangorse, Yrfon, Edw, Ithon, and Wye, with their collecting and communicating conduits and compensation reservoirs	8,135,000
Aqueduct, Llangorse to Elstree	7,160,000
Aqueduct, Yrfon reservoir to Banstead . .	8,070,000
Terminal works at Elstree, filters and connection with existing distribution pipes . .	4,850,000
Terminal works at Banstead, filters and connection with existing distribution pipes . .	5,500,000
	<hr/> 33,715,000
Contingencies 10 per cent. . . .	3,371,500
	<hr/> 37,086,500
Professional and Parliamentary . .	1,685,750
Total	<hr/> £38,772,250

Say £38,800,000

For 415 million gallons a day, or at the rate of £93.494
per million gallons.

But, as before pointed out, it is not necessary that the whole of this expenditure should be incurred in the immediate future. It will be sufficient if in the first instance the supply afforded by the Usk from the Llangorse reservoir of 182 million gallons a day be brought into the Elstree reservoir. This would cost, as per estimate below, say 17,500,000*l.*, or at a rate of 96,000*l.* per million gallons per day.

First instalment, Llangorse and Usk reservoirs,	£
182 million gallons a day	3,175,000
Aqueduct, Llangorse to Elstree	7,160,000
Terminal works at Elstree, including filters and distribution	4,850,000
	£15,185,000
Contingencies 10 per cent.	1,518,500
	£16,703,500
Professional and Parliamentary	759,250
Total	£17,462,750
For 182 million gallons a day, or at the rate of	£95,949
per million gallons.	

Following this, an additional supply of 18 million gallons a day could be obtained from the Edw at a further cost of 625,500*l.*, which would bring the total volume up to 200 million gallons a day at a total cost of 18,095,250*l.*, or at a rate of 90,476*l.* per million gallons delivered.

Previous expenditure	£17,462,750
Edw supply, including reservoir and conduit to main aqueduct, 18 million gallons a day	£550,000
Contingencies 10 per cent.	55,000
	£605,000
Professional and Parliamentary	27,500
Total for Edw supply	632,500
Total for a supply of 200 million gallons a day	£18,095,250

or at a rate of 90,476*l.* per million gallons.

It is obvious that the remaining supplies which can be derived from the Yrfon, the Towy, the Ithon, and the Upper Wye can be brought in one by one at a future date, but they would involve the construction of the second line of aqueduct from the Yrfon to Banstead.

From the whole of the above figures, I am not only confident that this scheme of works is the best for the supply of London, but I believe it to be the cheapest that could be introduced.

WATER SUPPLY OF LONDON

JOINT REPORT OF SIR BENJAMIN BAKER, K.C.M.G.,
AND MR. GEORGE FREDERICK DEACON

Terms of reference to Sir Benjamin Baker and Mr. G. F. Deacon, dated June 19, 1896—

1. There will be placed before the gentlemen in question the report and evidence of the Royal Commission, notes of evidence and speeches in the case of the Staines Water Bill, Session 1896, all the reports of the chief engineer relating to the Staines scheme, and to the proposed Welsh supply, together with all plans, sections, estimates, and rainfall observations which he has made since 1890, and also the various reports of the water committee.

2. Sir B. Baker and Mr. Deacon are requested to consider the detailed proposals, plans, and estimates contained in the report of the chief engineer, dated June 8, 1894, in connection with his scheme for obtaining water from the valleys of the Usk, Wye, and Towy, and their tributaries, and to advise the committee as to their suitability and sufficiency or otherwise.

3. The above-named engineers are requested to report on the question of the practicability and the cost of

carrying out schemes of storage for providing 200 million, 300 million, and 400 million gallons per day respectively from the Thames, on the lines of the suggestion in the report of the Royal Commission.

4. The above-named engineers, taking into consideration the whole of the circumstances of the case, and having regard to the increasing rate of consumption per head, are requested to give their best advice to the Council as to whether or not it would be more advantageous to bring into London from the proposed Welsh sources than from the Thames, the additional quantity of water over and above the quantity at present supplied which will be required for the supply of the population of $11\frac{1}{2}$ millions, as estimated by the Royal Commission.

5. The following further question is also proposed, upon which, if the engineers think it expedient, the committee will be glad to have a short preliminary report :

The attention of the engineers being directed to paragraph 10, on page 13 of the report of June 8, 1894, they are requested to advise generally as to whether in their opinion there is any other source of supply for the metropolis which presents such *a priori* advantages over either the scheme proposed by the engineer of the London County Council, or the suggested scheme of storage in the Thames valley, as would justify the selection of such other source in preference to both of the last-mentioned schemes.

CONCLUDING OBSERVATIONS

In accordance with the terms of the reference, we have reported on the suitability and sufficiency of the chief engineer's proposed Welsh supply, and on the practicability and the cost of carrying out schemes of storage for providing 200, 300, and 400 million gallons per day respec-

tively from the Thames on the lines of the Royal Commission report. The result of our investigations have led us to increase somewhat the magnitude of the works required for the Staines project, and in the Welsh project to admit some reservoirs and include others for compensation purposes. Having done this, we think the projects and the costs per unit as fixed by the projectors are fairly comparable.

The Welsh scheme would deliver water of unexceptionable quality, as good, no doubt, as the waters of Loch Katrine, Thirlmere, or Vyrnwy. Neither Glasgow nor Manchester thinks it necessary to filter such water, but Liverpool does filter it, and the chief engineer, rightly, we think, proposes that London should do the same. As to which portion of the Welsh scheme should be first carried out, we cannot, in the absence of the necessary details and surveys, offer a final opinion, but, on the information before us, we think it probable that the Wye sources will prove the more generally advantageous.

If enlarged in the manner we have indicated the Staines scheme would, we think, supply the stated quantities of water, but the quality, in our opinion, would not always be that apparently intended by the Royal Commission, since water in which the impurities were as great as they are on the average during the first fifteen days of a flood of 2,300 million gallons per day would frequently be taken into the reservoirs and even to the filters direct.

That the reservoirs would have a beneficial action in assisting the proper working of the filters we have no doubt, but we do not think any system of filtration, except a double and perfectly overlapping system, will at all times secure immunity from the passage of impure water, considering that, in the words of the Royal Commissioners, with which we concur, 'a new filter,'¹

¹ New in the sense of newly cleansed.

composed of perfectly purified sand, has little or no effect in producing either chemical or bacteriological purification.'

Having reference to the character and extent of the present London waterworks, and to the length of time which must elapse before any radical alteration of the system of supply could be effected, it is clear that neither the Staines nor the Welsh scheme, in its entirety, nor the estimate for either project, applies exactly to existing circumstances; and the most important and generally useful part of the reference to us is, therefore, the instruction to take into consideration the whole of the circumstances of the case, and to advise the Council whether, in our opinion, it would be more advantageous to bring into London from the proposed Welsh sources than from the Thames the *additional* quantity of water over and above the quantity at present supplied.

In considering the question from a practical point of view, it is necessary to remember that for the next ten or fifteen years the Thames must be the chief source of supply, and that there is little reason to suppose it will ever be entirely abandoned as an alternative or contributory source. In 1911 the quantity of water required by London will not, at the present rate of increase, exceed the existing powers of the water companies, which include supplies of 165 million gallons from the Thames, and 120 million gallons from the Lea and elsewhere, or 285 million gallons in all; so that as regards statutory power, no difficulty need arise from the delay incidental to the adoption of a Welsh project, except such as may be inseparable from the present divided administration.

We will, for the purpose of comparative estimates, assume that whether the Welsh supply be adopted or not, there would, before that supply could become available, be 165 million gallons per day taken from the Thames.

The question, therefore, is whether twelve or fifteen years hence, say in 1912, it would, on the whole, be more advisable to gradually increase that 165 million gallons as the growth of the population might require, or to introduce a supply of 200 millions in one or more instalments from Wales, and to correspondingly reduce the quantity pumped from the Thames and other sources.

As regards capital expenditure, no figures are required to show that it must necessarily be more costly to bring water from Wales than from Staines; and, further, whilst the Welsh scheme must be commenced earlier than the Staines', and be completed to the extent of one or two reservoirs and the greater part of one of the aqueducts before it becomes available, whilst the latter may be completed in smaller sections, the interest during the construction must be somewhat greater proportionately than the capital expenditure in the respective cases. On the other hand, the working expenses would all be in favour of the Welsh scheme, by reason of the cessation of pumping charges and the reduced working charges on filters and settling reservoirs.

We have considered many alternative ways of presenting our views as to the respective costs of the two systems of supply, and have thought, on the whole, that the price per thousand gallons of water distributed would be the most generally understood unit of comparison.

In relation to this comparison it is to be observed that the Staines scheme can only be worked on the conditions laid down, if it is made to apply to the whole of the water drawn from the Thames, that is to say, not only to the increment of volume between the present and the later date, but to the original volume also. If it did not so apply, the reservoirs, in order to maintain a flow of 200 million gallons a day over Teddington Weir, would have to be very much larger and more costly.

Let us suppose that either one, two, or three instalments of one of the 200 million gallons Welsh schemes were brought to London in 1911, when the pumping from the Thames would be nearly the statutory maximum of 165 million gallons a day. A portion of the pumping expenditure on the Thames, and possibly on the Lea also, would immediately cease, and the present excess of pumping in dry weather would be relieved. The wet weather difficulty would also be removed, because turbidity would be confined to a much smaller quantity of water with which slower filtration could be practised; and if it were thought desirable that settling reservoirs should be constructed to prevent the choking of the filters during floods, their size would be insignificant by comparison with the huge storage reservoirs which the Staines scheme at present demands to prevent the fall of the river below 200 million gallons a day at Teddington.

If, on the other hand, an attempt were made to apply the Staines scheme as a general solution for the future, not only must it be applied to the various increments of supply after 1911, but to the whole quantity previously pumped also. If the necessary Act of Parliament were obtained in 1898, we think there would be no difficulty in securing Welsh water before 1911. In the alternative of the adoption of the Staines scheme the works must be ready by the same date, and must have been constructed for the 165 million gallons a day, and for a small additional quantity to go on with, increasing to $66\frac{2}{3}$ millions plus that small additional quantity, in 1924, thirteen years later. We believe that such works would take about half as long to construct as the first instalment of the Welsh scheme, and we have apportioned interest on capital accordingly. The latter supplies from the Staines scheme (so far as it could be carried) might be extended in instalments of about 40 million gallons a day.

We will assume in the first instance that the whole of the 200 million gallons of Welsh water is brought to London in 1911, and that the pumping charges are proportionately reduced.

Upon these conditions, on the views of the Royal Commission as to increase of population and of demand for water, and on the assumption that interest and sinking fund can be provided for a rate of 3 per cent., we arrive at the following conclusions regarding the relative costs per 1,000 gallons of the additional supply from Wales and from the Thames—

- (a) That until 1911 the question of the relative cost per 1,000 gallons does not arise.
- (b) That in 1911 the supply from the Thames would probably be 165 million gallons per day, and from other existing sources 120 million gallons, being 285 million gallons in all, which is the total quantity for which statutory powers have been at present obtained. With the additional quantity of 200 million gallons from Wales this would suffice for London for a further period of thirty-three years after 1911, or until the year 1944, and additional supplies could be obtained from Wales as might be required.
- (c) That with the Staines reservoir project, in the same year, 1944, the supply would be 365 million gallons from the Thames and 120 million gallons from other sources.
- (d) Dividing the interval between 1911 and 1944 into three periods of eleven years each, we find that for the first period the extra cost of the purer and softer Welsh water would be less than 1*d.* per thousand gallons; for the second period less than $\frac{1}{2}$ *d.*, whilst for the third period it would practically be nil.

The preceding figures would be varied if the 200 millions were brought from Wales to London in successive instalments, but not to an extent affecting the deductions to be drawn from them.

Our opinion as engineers as to what would be the 'more advantageous' course to adopt, assuming the above estimates to be reasonably correct, is of course not worth more than that of others who are not engineers, but we have been asked to give our 'best advice to the Council,' and we therefore venture to make the following general remarks.

The Royal Commissioners observe (paragraph 178) that they 'are well aware that a certain prejudice exists against the use of drinking water derived from the Thames and the Lea, because those rivers are liable to pollution.'

On this we would remark that the two rivers are actually and seriously polluted, and it is impossible to foresee whether the prejudice on this account may not increase for the future. The Council have to consider, not what are the present views of the majority of the ratepayers, but what may possibly be the views of their successors, say twenty years hence; for it is the future rather than the present generation that would be most affected by any decision the Council may now make.

The whole history of the London water supply shows a steady and continuous demand on the part of the public for increased purity of water, and we have no reason to assume that the desire to get the purest water reasonably attainable will cease to grow. Experience elsewhere has proved that the quantity and quality of water insisted upon in any given place depend at least as much upon the 'prejudices' and 'sentimental objections' of the inhabitants as upon hygienic considerations.

To illustrate this we may state that in a recent water

dispute, in which we were both engaged, evidence was adduced that it was the custom for whole families of colliers to use the same bath daily in order to economise hot water. No sentimental objections on their part, nor hygienic objections on the part of the medical officer of health, existed to prevent this being done, but we well know that in most cases sentimental objection to the use of water, even for ablutionary purposes, which has been slightly contaminated by another person, is so strong as to impose upon public bodies the duty of supplying sufficient water for every one to have a separate bath, cost being a secondary consideration. There can surely be little question that if individual members of the public could exercise the same choice as regards water for potable purposes, they would select the least contaminated water reasonably attainable, as they do when merely a bath is in question.

Happily the evidence brought before successive Royal Commissions as to the general quality of water at present supplied, notwithstanding the pollution of the source of the supply, relieves the Council from the necessity of adopting any heroic measure, such as the entire abandonment of the Thames and Lea in the interests of public health; but it does not relieve the Council from the necessity of giving due weight as regards any additional supply to the 'prejudice' which the Royal Commissioners refer to in their report. No one acting for himself personally with regard to a water supply to his own country-house would allow a small difference in cost to determine whether he should go to a pure spring or to a stream into which some other house drained, although the latter might be so remote that he could allege no better reason for his decision than 'prejudice.' It appears to us that in coming to a decision upon so vital and irrevocable a question as the additional supply of water to London for

a long series of years, the safer course would be to act for future generations as our instinctive and deeply-rooted feelings in favour of pure water would lead us to act for ourselves. It is true that the results of chemical and biological researches in relation to filtered Thames water are eminently reassuring, but it is necessary to remember that science has not said the last word on this or any other subject.

In following the course suggested, entire consistency, we venture to think, would be preserved with the admittedly proper action of public bodies generally in matters relating to pure air and pure water. Thus the restriction of the heights of houses in streets of certain width, and the pecuniary loss thereby imposed upon owners, is justified upon broad general principles and not upon the number of bacteria observable in different streets. It is held reasonable also to insist upon certain minimum heights of rooms in new buildings as conducive to purity of air, although this involves increased cost ; but it would be held unreasonable, except in extreme cases, to order the demolition of existing and otherwise good buildings because they did not comply with the same requirements. Similarly it might be considered unreasonable to dispense with the existing water supply from the Thames and the Lea, and at the same time, to be quite reasonable, to insist upon an unpolluted supply for future requirements, and this notwithstanding that some increase in cost may be involved.

It is hardly necessary to observe that the Royal Commissioners in their report recommend on hygienic grounds that the water should be delivered for consumption in as unpolluted a condition as large subsidence reservoirs, perfect filtration, and the exercise of all possible vigilance in preventing unnecessary contamination of the Thames would admit, and *a fortiori* apart from the

question of cost, an initially unpolluted supply must have met their approval.

The Commissioners also acknowledge the existence of a 'not unnatural sentiment against drinking water which, though wholesome, has been polluted at an earlier stage,' and the strongest advocates of the Thames supply admit that the wholesomeness of such water depends upon efficient filtration, which has not always been secured in the past.

Apart, however, from satisfying sentimental objections and hygienic doubts, the adoption of the Welsh project for additional supplies would have the further advantage of introducing a volume of soft water to London and of leaving a corresponding body of land water in the river to dilute the sewage and to clear the bed and banks of deposits.

As regards the first point, we adopt the conclusion of the Duke of Richmond's Committee of 1869—'That for washing and for manufacturing purposes generally, soft water is preferable as more efficient and economical, but there appears no means of expressing the amount of saving in a money estimate.' We agree also that this advantage does not in itself render it 'necessary' to go to a great distance for soft water. As regards the abstraction of water from the Thames, there is even a greater difficulty in expressing the results in a money estimate; but we do not think any hydraulic engineer would question the serious disadvantage of extending the present period of minimum flow of 28 days in any year to more than 200 days.

Summarising our views generally 'on the whole of the circumstances of the case,' and therefore sometimes upon matters governed by personal feeling rather than by engineering principles, which we should not have ventured to do had the terms of the reference not imposed this

duty upon us, we may state our general conclusions as follows :

- (1) That for the next ten or fifteen years the Thames must necessarily remain the chief source of supply for London.
- (2) That together with the wells and probably the Lea, the Thames will always be maintained as an alternative or contributory source of supply if for no other reason than that set forth by the Duke of Richmond's Commission, namely, the undesirability of any change by which the metropolis would become dependent upon a single source of supply which might be liable to accidental interruption.
- (3). That the evidence brought before the Royal Commission as to the quality of the existing supply when perfectly filtered shows that there is no reason for entirely abandoning the present sources of supply, though views differ widely as to the maximum quantity which may be taken from the Thames with impunity.
- (4) That the practical question for decision within the next year or two is whether twelve to fifteen years hence the additional supply shall come from the Thames or from Wales.
- (5) That the personal prejudices and sentiments of the public, rather than the opinions of engineers, chemists, and accountants, are the most powerful factors in deciding such questions, and therefore it is not necessarily a wise course to accept the lowest tender and take an inferior article where water supply is concerned.
- (6) Personally, we should feel no hesitation in deciding that the *additional* supply of water should, as far as possible, come from Wales, because we should then, in our opinion, have had all reason-

able regard both to true economy and to existing and future prejudices and sentimental or real objections to an initially polluted and subsequently more or less purified supply. We should, in short, be doing for the population collectively what we should be doing for ourselves individually in going to a pure spring, if there were one reasonably available for our own domestic supply, although it might involve a little more trouble and expense.

- (7) The extra trouble and expense to individual households in London of getting the additional supply of water from the purest source available rather than out of the nearest stream would be insignificant compared with that willingly incurred by country residents and cottagers for the same object, since on the basis of the figures given in this report for the first 200 million gallons a day, it would involve an additional expenditure of less than a penny per week for an average household, whilst for the second instalment of 200 million gallons the Welsh water would be the cheaper of the two.

We are, gentlemen,

Your obedient servants,

BENJAMIN BAKER.

GEORGE F. DEACON.

WESTMINSTER, S.W.,

March 26, 1897.

METROPOLIS WATER ACT, 1852

CAP. LXXXIV

An Act to make better Provision respecting the
Supply of Water to the Metropolis

[1st July 1852]

Whereas it is expedient to make provision for securing the supply to the metropolis of pure and wholesome water, and otherwise to make further and better provision in relation to the water supply of the metropolis: be it therefore enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same as follows:

I. From and after the thirty-first day of *August* one thousand eight hundred and fifty-five it shall not be lawful for any company supplying the metropolis or any part thereof with water for domestic use, except the Governor and Company of *Chelsea* Waterworks, to take any water for such purpose from any part of the river *Thames* below *Teddington* Lock, or from any part of any of the tributary rivers or streams of the river *Thames* below the highest point where the tide flows in such tributary rivers and streams respectively; and from and after the thirty-first day of *August* one thousand eight hundred and fifty-six it shall not be lawful for the said Governor and Company of *Chelsea* Waterworks to take any water for domestic use from any part of the river *Thames* below *Teddington* Lock.

Restriction
as to sources
of supply of
water to the
metropolis

II. From and after the thirty-first day of *August* one thousand eight hundred and fifty-five every reservoir

Reservoirs,
within a
limited dis-
tance, to be
covered

within a distance in a straight line from *Saint Paul's Cathedral* in the City of *London* of not more than five miles, in which water for the supply for domestic use of the metropolis or any part thereof is stored or kept by any company, shall be roofed in or otherwise covered over: provided always that this provision shall not extend to any reservoir the water from which is subjected by the company to efficient filtration after it is discharged from such reservoir, and before it is passed into the mains or pipes of the company for distribution, or to any reservoir the whole of the water from which is distributed through distinct mains or pipes for other than domestic purposes, nor to any reservoir whatever, the water stored in which shall be used exclusively for other than domestic purposes.

Water not
to be
brought
within a
limited dis-
tance in open
aqueducts

III. From and after the thirty-first day of *December* one thousand eight hundred and fifty-five, no water shall be brought or conducted within the metropolis by any company for the purpose of domestic use otherwise than through pipes or through covered aqueducts, unless the same shall be afterwards filtered before distribution.

Every com-
pany to
filter all
water sup-
plied by
them for
domestic
use

IV. From and after the thirty-first day of *December* one thousand eight hundred and fifty-five, every company shall effectually filter all water supplied by them within the metropolis for domestic use, before the same shall pass into the pipes for distribution, excepting any water which may be pumped from wells into a covered reservoir or aqueduct, without exposure to the atmosphere, and which shall not be afterwards mixed with unfiltered water.

Company to
give notice
to Board of
Trade before
resorting to
new sources
of supply,
who may

V. Three months before any company shall resort to any new source of supply, such company shall give notice in writing thereof to the Lords of the Committee of Privy Council for trade and plantations, hereinafter called the Board of Trade, and thereupon, within one month after

receipt of such notice, the said Board of Trade shall, if they think fit, appoint a competent person as an inspector, who shall report with respect to any sources then specially authorised by Parliament, whether the directions of the special Act have been complied with in reference thereto, and with respect to any new sources not specially authorised by Parliament, whether the same are capable of supplying good and wholesome water for domestic purposes.

thereupon
appoint an
inspector to
report

VI. The inspector so appointed as aforesaid shall within ten days after such appointment give notice in writing to the company thereof, and of the time at which he proposes to visit and inspect the said sources, and thereupon, in order to enable him to make such report as aforesaid, it shall be lawful for the said inspector to enter the lands wherein such sources respectively are situate, and to examine and make inquiry touching the premises.

Inspector to
give notice
to companies
of his inten-
tion to visit
new sources

VII. The Board of Trade shall, within twenty-one days after the receipt from the said inspector of his report, send to such company with respect to any such new sources of supply not specially authorised by Parliament a certificate in writing of their approval or disapproval thereof, and with respect to any such sources as shall then be specially authorised by Parliament a notice in writing stating whether in the judgment of the said Board of Trade the directions of the special Act have in reference thereto been complied with.

Board of
Trade to
certify their
approval or
disapproval
of new
sources

VIII. After the company shall have received a certificate that the said Board of Trade disapproves of any such new source of supply not specially authorised by Parliament as aforesaid, it shall not be lawful for the company to use the said source, and after receipt of such notice as aforesaid that in the judgment of the said Board of Trade the directions of the special Act with reference to any sources then specially authorised by Parliament

If Board of
Trade dis-
approve,
company not
to use new
source of
supply

have not been complied with, it shall not be lawful for the company, before complying with such directions with reference to such source, to use the same.

On complaint as to quantity and quality, Board of Trade may appoint a person to inquire and report

IX. If at any time complaint as to the quantity or quality of the water supplied by any company for domestic use be made to the Board of Trade by memorial in writing signed by not less than twenty inhabitant Householders paying rents for and supplied with water by the company, it shall be lawful for the Board of Trade, at any time within one month after the receipt of such complaint, to appoint a competent person to inquire into and concerning the grounds of such complaint, and to report to the Board of Trade thereon.

Powers of person appointed

X. The person so appointed as aforesaid shall, within three days after such appointment, give notice thereof in writing to the company, and after such notice as aforesaid he shall have power to inspect and examine the waterworks of the company, and to inquire into and concerning the grounds of such complaint; and the company and their officers shall afford all reasonable facilities for such inspection, examination, and inquiry.

Penalty for obstructing inspector

XI. Any person obstructing such inspector in the due prosecution of such inspection, examination, or inquiry, shall forfeit and pay any sum not exceeding ten pounds.

If complaint well founded, notice to be given to company

XII. If after receipt of such report it shall appear to the Board of Trade that the said complaint is well founded, the Board of Trade shall give notice thereof in writing to the company.

Company to remove ground of complaint

XIII. After the receipt of such notice the company shall and they are hereby required within a reasonable time to remove the grounds of such complaint.

Engines to consume their own smoke

XIV. Every steam engine, furnace, or other work in which coals which produce smoke during combustion shall be consumed by any company for the purpose of the

waterworks shall be constructed on the most effectual principle for consuming its own smoke.

Section XV. repealed by Metropolis Water Act, 1871.

XVI. Any company which shall violate, refuse, or neglect to comply with any of the provisions hereinbefore contained shall forfeit to her Majesty the sum of two hundred pounds, and the further sum of one hundred pounds for every month during which they shall continue to violate or to refuse or neglect to comply with the same after they shall have received notice in writing from the Board of Trade to discontinue such violation, refusal, or neglect as aforesaid.

Penalty for non-compliance with the provisions of the Act.

XVII. Every company shall, within one year after the passing of this Act, cause a map to be made of the district within which any mains or district mains shall have been laid down or formed by them on a scale not less than six inches to a mile, and shall cause to be marked thereon the course and situation of all existing mains and district mains, and shall, within six months from the making of any alterations or additions, cause the said maps to be from time to time corrected, and such additions made thereto as may show the line and situation of all such mains and district mains as may be laid down or formed by them from time to time after the passing of this Act; and such map, or a copy thereof, with the date expressed thereon of the last time when the same shall have been so corrected as aforesaid, shall be kept in the principal office of each company, and shall be open to the inspection of all persons interested in the same within the said district, who shall be at liberty to take copies of or extracts from the same.

Map of underground works of the companies to be made, and kept at principal office of each company, and be open to inspection

XVIII. Every company, on the application of any person supplied with water by such company, shall furnish to such person the particulars of any district main from which such person is supplied, together with

Companies to furnish particulars of district mains when required

the names of the streets through which such district main passes, and the commencement and termination thereof.

Sections XIX. to XXII. repealed.

Cisterns, closets, and baths, to be so constructed as to prevent waste or the flow or return of impure matter into the mains, &c.

XXIII. Every cistern or other receptacle for water, and every closet, soil-pan, and private bath which shall be supplied with water by any company, shall be so constructed and used as effectually to prevent the waste, misuse, or undue consumption of water, and the flow or return of foul air or other noisome or impure matter into the mains or pipes of the company, or into any pipes connected or communicating therewith; and notwithstanding anything in 'The Waterworks Clauses Act, 1847,' or in this Act contained, no company shall be bound to supply water into any cistern or other receptacle for water, closet, soil-pan, or private bath, which shall not be so constructed and used.

Restricting communication with pipes of the company

XXIV. No person shall make or lay down, or permit to be made or laid down, any pipe or other means or contrivance for taking, using, or obtaining water to communicate with any pipe or apparatus connected with any of the mains or pipes of any company without giving such notice, and except under such superintendence, and according to such direction as is provided by 'The Waterworks Clauses Act, 1847,' with respect to the communication pipes to be laid by the inhabitants.

Water may be cut off in certain cases

XXV. If any person supplied with water by any company shall wilfully do or cause to be done any act, matter or thing in contravention of the provisions of this Act, or of the special Act relating to such company, or of any Act incorporated therewith, or shall wilfully omit or neglect to do any matter or thing which under such provisions ought to be done for the prevention of the waste, misuse, or undue consumption, or the contamination of the water of the company, it shall be lawful for the company

to turn off the water supplied by them to such person, and to cease to supply such person with water, and also to recover from such person by action or suit in any court of competent jurisdiction the amount of any loss, damage, or injury which such company may sustain by means or in consequence of any such act, matter, or thing as aforesaid, or of any such wilful omission or neglect as aforesaid.

XXVI. It shall be lawful for any company from time to time, with the approval of the Board of Trade, to make such regulations as shall be necessary or expedient for the purpose of preventing the waste or misuse of water, and therein, amongst other things, to prescribe the size, nature, and strength of the pipes, cocks, cisterns, and other apparatus to be used, and to interdict any arrangements, and the use of any pipes, cocks, cisterns, or other apparatus which may tend to such waste or misuse as aforesaid.

Regulations
to be made
with ap-
proval of
Board of
Trade

Section XXVII. repealed.

XXVIII. In citing this Act in other Acts and in legal instruments it shall be enough to use the expression 'The Metropolis Water Act, 1852.'

Short title

XXIX. In the construction of this Act the expression 'company' shall mean and include any of the companies hereinafter enumerated (that is to say); the Governor and Company of the *New River* brought from *Chadwell* and *Amwell* to *London*, commonly called 'The *New River* Company'; the company of proprietors of the *East London* waterworks; the *Southwark and Vauxhall* Water Company; the *West Middlesex* Waterworks Company; the *Lambeth* Waterworks Company; the Governor and Company of *Chelsea* Waterworks; the *Grand Junction* Waterworks Company; the Company of Proprietors of the *Kent* Waterworks; and the *Hampstead* Waterworks Company; and also any other company, board, com-

Interpreta-
tion of
terms

missioner, association, person or partnership, corporate or unincorporate, for the time being, supplying the metropolis or any part thereof with water for domestic use; the expression 'the special Act' shall mean and include this Act, and every and any Act of Parliament relating to the company referred to; and the expression 'the metropolis' shall mean and include all places described or referred to in the Schedule to this Act.

THE SCHEDULE ABOVE REFERRED TO

All such places lying on the north side or left bank of the River Thames as are within the exterior boundaries of and are within the ambit formed by the parishes of Fulham, Hammersmith, Kensington, Paddington, Hampstead, Hornsey, Tottenham, Saint Pancras, Islington, Stoke Newington, Hackney, Stratford-le-Bow, Bromley, Poplar, and Shadwell.

Such part of the Parish of Chelsea as lies north of the said Parish of Kensington.

And such parts and places lying on the south side or right bank of the said river as are within the exterior boundaries of and are within the ambit formed by the Parishes of Woolwich, Charlton, Greenwich, Deptford, Lee, Lewisham, Camberwell, Lambeth, Streatham, Tooting, Wandsworth, and Putney.

METROPOLIS WATER ACT, 1871

CHAPTER CXIII

An Act to amend ‘The Metropolis Water Act, 1852,’ and to make further provision for the due supply of water to the Metropolis and certain places in the neighbourhood thereof.
[21st August 1871.]

Whereas it is expedient to amend ‘The Metropolis Water Act, 1852;’ and to make further provision for securing to the metropolis and to certain places in the neighbourhood thereof a constant supply of pure and wholesome water :

15 & 16 Vict.
c. 84
(public)

Be it therefore enacted by the Queen’s most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same as follows :

Preliminary

1. This Act may be cited for all purposes as ‘The Metropolis Water Act, 1871.’

Short title

2. This Act and the Metropolis Water Act, 1852, as the same is amended by this Act, shall be read and construed together as one Act.

This and
recited Act
to be as one

3. In this Act,—

The expression ‘the metropolis’ shall mean the metropolis as defined by the Metropolis Management Act, 1855 :

Interpreta-
tion of
terms

The term ‘company’ shall mean and include any of the companies following; that is to say,—

The Governor and Company of the New River

brought from Chadwell and Amwell to London, commonly called the 'New River Company;'

The East London Waterworks;

The Southwark and Vauxhall Water Company;

The Company of Proprietors of the West Middlesex Waterworks Company;

The Company of Proprietors of Lambeth Waterworks;

The Governor and Company of Chelsea Waterworks;

The Grand Junction Waterworks Company;

The Company of Proprietors of the Kent Waterworks;

and also any other corporation, company, board, commissioners, association, person, persons, or partnership, for the time being supplying water for domestic use within the limits of this Act:

The term 'person' shall include a corporation aggregate or sole:

The expression 'water limits' in relation to a company shall mean such parts of the limits within which such company is authorised to supply water as are within the limits of this Act:

The expression 'the special Act' in relation to a company shall mean and include every and any Act of Parliament relating to such Company:

The expression 'metropolitan authority' shall mean, in the places specified in the table in the Schedule (A.) to this Act annexed, the bodies or persons named in the same table:

The term 'district' shall mean the area selected

for the purpose of constant supply, such area being within the jurisdiction of a metropolitan authority, and also within the water limits of a company, and being coterminous with some one or more services of such company :

The term 'premises' shall mean and include any dwelling-house and any part of a dwelling-house, and any stable, yard, or other offices used together or in connection with any dwelling-house or any part of a dwelling-house :

The term 'prescribed' shall mean prescribed by any regulations made under the authority of this Act :

The term 'court of summary jurisdiction' means and includes any justice or justices of the peace, metropolitan police magistrate, or officer, by whatever name called, to whom jurisdiction is given by the Act passed in the session of Parliament held in the eleventh and twelfth years of the reign of her present Majesty, intituled 'An Act to facilitate the Performance of the Duties of Justices of the Peace out of Sessions within England and Wales with respect to Summary Convictions and Orders,' and any Acts amending the same :

The term 'fittings' includes communication pipes and also all pipes, cocks, cisterns, and other apparatus used or intended for supply of water by a company to a consumer, and for that purpose placed in or about the premises of the consumer :

The term 'owner' means the person who, for the time being, receives the rackrent of the premises with reference to which that term is used, whether on his own account or under or by

virtue of any mortgage or charge, or as agent or trustee for any person, or who would so receive the same if the premises were let at a rackrent, and includes every successive owner from time to time of the premises, being such for any part of the time during which the enactment wherein that term is used operates in relation to the premises :

Premises shall be deemed to be on the same service, or on a service, when water is supplied to them by a company from the same service pipe.

Limits of
Act

4. The limits within which the provisions of this Act shall be in force and have effect (in this Act referred to as 'the limits of this Act') shall include the metropolis and the several places set out in the schedule to the Metropolis Water Act, 1852, which do not form part of the metropolis.

Repeal of
parts of
Metropolis
Water Act,
1852

5. From and after the passing of this Act, the sections of the Metropolis Water Act, 1852, specified in the Schedule (B.) to this Act annexed, shall be and the same are hereby repealed, so far as regards their operation within the limits of this Act: provided always, that no such repeal shall affect any act, matter, or thing duly done or agreed upon before the passing of this Act, under the authority of any of the sections of the said Act hereby repealed.

Supply of
water on
Sundays

6. From and after the passing of this Act every company shall on Sundays as on other days supply sufficient pure and wholesome water for the domestic use of the inhabitants within their water limits.

Constant Supply

Companies
to provide
constant
supply of
water

7. Subject to the provisions of this Act, every company may, and from and after the expiration of eight months from the passing of this Act every company

shall, when required so to do, in the manner directed by this Act, provide and keep throughout their water limits, or throughout such parts of such limits as they may be required in manner aforesaid, a constant supply of pure and wholesome water sufficient for the domestic purposes of the inhabitants within such water limits, constantly laid on at such pressure as will make such water reach the top storey of the highest houses within such water limits (but not exceeding the level prescribed by the special Act) of such company (which supply is in this Act referred to as a 'constant supply'); and every such company shall, subject to the provisions of the special Act as the same are amended by this Act, give and continue to give to such inhabitants a constant supply for domestic purposes in manner prescribed.

8. At any time after the expiration of six months from the passing of this Act, the metropolitan authority shall, whenever they are of opinion that there should be in any district a constant supply, make application to the company within the water limits in which such district is situate, requiring a constant supply in such district, and any company may without any such application propose to the metropolitan authority to give a constant supply in any district.

Application
for constant
supply

9. When application has been made to any company requiring such company to provide a constant supply, or when any company has given notice to a metropolitan authority of a proposal to give a constant supply in any district, and the company so required, or the metropolitan authority upon whom notice of such proposal has been served, object to such requisition or proposal, it shall be lawful for such company or metropolitan authority, within one month after the making of such application or service of such notice, to present a memorial to the Board of Trade, setting forth their objections to such requisition or proposal, and the

Appeal to
Board of
Trade

party presenting such memorial, or such company, shall give notice to the other party of the presentation of such memorial, and shall transmit to such party a copy of the same. The Board of Trade shall, as soon as conveniently may be after the receipt of such memorial, take the same into their consideration, and may, if they think fit, institute any inquiry in relation thereto, and may hear such company and authority desiring to be heard, and may make such order in reference thereto, and as to the costs thereof and incident to the same, as to them shall seem just.

Restriction
as to com-
pulsory
supply by
companies

10. No company shall be compelled to give a constant supply to any premises in any district until the regulations provided for by this Act are made and are in operation within such district, or if it can be shown by such company that at any time after the expiration of two months from the time of the service of any requisition for constant supply more than one-fifth of the premises in such district are not provided with the prescribed fittings, without prejudice nevertheless to any renewed requisition at a future period.

In any district in which any default in respect of the prescribed fittings shall be found, the metropolitan authority may by notice in writing require the owner or occupier of any such premises, within a time to be specified in such notice, to provide the prescribed fittings, or to cause the fittings in such premises to be repaired so as to prevent any waste of water, and if any person fail to comply with the terms of such notice the metropolitan authority may provide for such premises the prescribed fittings, or repair the fittings within the same, as the case may be.

The expenses incurred by the metropolitan authority in providing such fittings or in making such repairs shall be paid to them by the person liable to pay the rate for

the water supplied, or on whose credit the water is supplied, or by the owner of the premises.

All such expenses may be recovered, with costs, from the owner, and to the extent of any rent due by the occupier of the premises, from such occupier, by proceedings in a court of summary jurisdiction, or by action in any court having jurisdiction locally in the matter, as if the same were an ordinary simple contract debt; and any sum and costs so recovered from an occupier may be deducted by him from the rent payable by him to the owner, and shall be allowed by the owner and every other person interested in the rent, as if the same had been actually paid as rent; but if in any case an occupier fails to disclose the amount of rent due by him, or the name or address of the owner, he shall be liable to pay the full amount of such expenses and costs: provided further that as between any such owner and occupier nothing herein contained shall be taken to affect any contract made between them respecting the payment of the expenses of any such works as aforesaid.

11. It shall be lawful for the Board of Trade, at any time after the expiration of six months from the passing of this Act, to require a constant supply to be provided in any district by the company within the water limits of which such district is situate, upon complaint made, and in case it appears to such board, after due inquiry,—

Power to
Board of
Trade to
require con-
stant supply
in certain
cases

That the metropolitan authority refuses to make or unreasonably delays making application for such constant supply, or

That, by reason of the insufficiency of the existing supply of water in such district, or the unwholesomeness of such water in consequence of its being improperly stored, the health of the inhabitants of such district is or is likely to be prejudicially affected.

Notice re-
quiring or
proposing
constant
supply to
be served
upon com-
pany or me-
tropolitan
authority

12. Where a constant supply is required in any district, notice to that effect shall be served, on behalf of the party requiring the same, upon the company required to provide such supply; and where a constant supply is proposed to be given in any district by any company, notice to that effect shall be served on behalf of such company upon the metropolitan authority. In every such notice shall be stated accurately the district in which such constant supply is required or proposed to be given, and the day (not being an earlier day than four months after the date of the service of such notice) upon and from which such supply is to commence.

Extension
of time to
companies

13. Where a constant supply is required in any district, and the company is unable, from want of funds or other cause of any kind, to execute all the necessary works within the time prescribed by this Act, the Board of Trade, if they think fit, may extend the time for the giving of such supply generally, or may extend the time, and direct such supply to be given at different times in succession, to the several parts of such district in such manner as may be found most convenient: provided that application be made by the company for such extension of time within one month after the notice referred to in the last preceding section has been served upon them.

Provision
for supply in
courts, pas-
sages, &c.

14. With respect to cases where a group or number of dwelling-houses are situate in a court or passage, or otherwise in contiguity with or in close neighbourhood to one another, the following further provisions shall have effect; that is to say:

- (1) If at any time it appears to the Board of Trade, on the report of the nuisance authority, as defined by the Sanitary Act, 1866, that a constant supply cannot be well and effectually provided for that group or number of dwelling-houses,

except by means of a stand-pipe or other apparatus placed outside the dwelling-houses, the Board of Trade may from time to time make an order to the effect that such group or number of dwelling-houses may be so supplied, and shall serve the same on the company within whose water limits the dwelling-houses are situate :

- (2) If the requisite stand-pipe or other apparatus in accordance with the regulations of the company is provided, then the company shall give to those dwelling-houses a supply accordingly by means of the stand-pipe or other apparatus so provided, and on giving such supply shall be entitled to receive and recover water rates or rents from the owners or occupiers of such dwelling-houses as if the supply had been given in the premises. The expense of providing such stand-pipe or other apparatus shall be borne by the owner of the dwelling-houses, or if there is more than one owner then by the respective owners in such proportions as the Board of Trade shall direct :

- (3) The Board of Trade may at any time abrogate, wholly or in part, the order, or may originally grant it only for a limited period.

15. *Notwithstanding anything in this Act, a company shall not be subject to any liability for not giving a constant supply if the want of such supply arises from frost, unusual drought, or other unavoidable cause or accident.*

Provision for
case of frost
&c.

16. Any company which violates, refuses, or neglects to comply with any of the preceding provisions of this Act shall be liable to a penalty not exceeding two hundred pounds, and to a further penalty not exceeding one hundred pounds for every month during which such violation or refusal or neglect to comply with the said

Penalties for
non-compliance with
preceding provisions

provisions continues after they shall have received notice in writing from the Board of Trade to discontinue such violation, refusal, or neglect as aforesaid.

Regulations

Company
may make
regulations

17. Every company shall, within six months after the passing of this Act, make regulations for the purpose for which regulations may be made under the authority of section 26 of the Metropolis Water Act, 1852, and the provisions of that section shall apply also to the preventing of undue consumption or contamination of water.

Amendment
of regula-
tions

18. Any company, if it thinks fit, or if requested so to do by the Board of Trade, may repeal or alter any of the regulations made for the purposes aforesaid, or make new regulations instead of any of the same.

In case of
default by
companies,
Board of
Trade may
appoint per-
son to report
as to re-
gulations,
and may
make same

19. In case any company does not make regulations within the time specified in this Act, or in case any company, on being requested in writing by the metropolitan authority, or by any ten consumers of the water supplied by that company, to repeal or alter any of the regulations for the time being in force, or to make new regulations instead of any of the same, refuses so to do, the Board of Trade may, if they think fit, appoint a competent and impartial person of engineering knowledge and experience to report to them as to such regulations as may be necessary for the execution of this Act, or as to the expediency of altering or repealing such regulations, or of making new regulations, in conformity with such request as aforesaid, and on the report of such person the Board of Trade may make such regulations, repeal, or alterations as they think fit.

Penalties for
offences
against
regulations

20. By any regulations made under the authority of the Metropolis Water Act, 1852, or of this Act, penalties may be imposed for offences against the same not exceeding in respect of any offence the sum of five

pounds, so that every such regulation be so framed as to allow part only of the maximum penalty being inflicted, and any such penalty shall be recoverable as penalties under this Act are recoverable.

21. Within four days after the making of any regulation, or of any appeal of or alteration in any regulation, notice of the same shall be served upon the metropolitan authority by the company or person making the same.

Notice of regulations to be delivered to metropolitan authority

22. No regulation, and no appeal or alteration of any regulation, made under the authority of the Metropolis Water Act, 1852, or of this Act, by a company, shall be of any force or effect unless and until the same be submitted to and confirmed by the Board of Trade, who may institute such inquiry in relation thereto as they shall think fit, and who at such inquiry shall hear the metropolitan authority and the company, if desiring to be heard, and the said board shall, if they think fit, or if requested, nominate and have present at such inquiry to advise and assist them a competent and impartial water-works engineer. The Board of Trade may, after such inquiry, confirm or disallow any such regulation, repeal, or alteration, in whole or in part, or may confirm the same with such modification or alteration as they may think proper; and no such regulation, repeal, or alteration shall be made by the Board of Trade on any such report as aforesaid, except after a like inquiry and hearing, with the like advice and assistance as aforesaid: provided that no such regulation, repeal, or alteration shall be confirmed or made (as the case may be) by the Board of Trade unless notice in that behalf shall have been given by the company to which the same relates, or by such person as the Board of Trade direct, in the 'London Gazette' and in two daily morning newspapers circulated within the limits of this Act one month at least before the inquiry; and one month at least before any such inquiry is held a

Confirmation of regulations

copy of the regulation, repeal or alteration in question shall be sent by such company or person to the office of the metropolitan authority, and the same shall for one month be kept open during office hours at the respective offices of the metropolitan authority and of the said company to the inspection of all persons, without fee or reward, and a copy of the same or of any part thereof shall be furnished to every person who shall apply for the same, on payment of sixpence for every one hundred words contained in such copy.

Publication
of regula-
tions

23. A printed copy of all regulations in force for the time being shall be kept at the office of the metropolitan authority and of every company within the limits of this Act, and all persons may at all reasonable times inspect such copy without payment, and each company shall cause to be delivered a printed copy, authenticated by their seal, of all regulations for the time being in force to every person applying for the same, on payment of any sum not exceeding one shilling and sixpence for such copy, and a printed copy of the regulations for the time being in force relative to any particular district only to every person applying for the same, on payment of any sum not exceeding threepence for every such copy.

Regulations
to be binding
upon all
parties

24. All regulations, and every repeal of or alteration in any regulation made, shall, after publication in manner by the last preceding section of this Act directed, be binding upon and be observed by all parties, and shall be sufficient warrant for all persons acting under the same, and a company shall not be bound under any agreement to supply or continue to supply water to any premises unless such regulations as are for the time being in force are duly observed in respect of those premises.

Evidence
of regula-
tions

25. A printed copy of regulations relating to any company, dated and purporting to be made as aforesaid, and to be authenticated by the seal of such company,

shall be conclusive evidence of the existence and of the due making, confirmation, and publication of such regulations in all prosecutions or proceedings under the same, without adducing proof of such seals, or of the fact of such confirmation or publication of such regulations or of any of the requirements of this Act relative thereto having been complied with.

Supply of prescribed fittings

26. When notice in relation to a constant supply in any district has been served upon or by any company, the party by whom or on whose behalf such notice shall be served, shall, within five days after the service thereof, cause to be published a copy of the same once in the 'London Gazette,' and copies of the same once at least in each of two successive weeks in any two daily newspapers circulated within the limits of this Act.

Notice relating to constant supply to be published in 'London Gazette,' &c.

27. Where in any district any company is required or has proposed to provide a constant supply, such company may, at any time after the expiration of one month after the publication in the 'London Gazette' of a copy of the notice requiring or proposing such constant supply, unless a memorial or application has been presented or made to the Board of Trade objecting to such constant supply or seeking an extension of time, and if any such memorial or application has been presented or made, then at such time after the determination of the Board of Trade in relation to such memorial or application as such board shall approve and order, cause to be served on the owner or occupier of any premises within such district a notice requiring such owner or occupier to supply such premises with the prescribed fittings.

Company may issue notice upon owners and occupiers to provide prescribed fittings

28. Every owner or occupier of premises upon whom notice to that effect has been served shall, within two months after the date of the service of such notice, provide

Owner or occupier to provide prescribed fittings

the prescribed fittings, and shall from time to time keep the same in proper repair.

29. Where in any district any company is required or has proposed to provide a constant supply, and

In case of
default by
owner or
occupier,
company
may provide
or repair
prescribed
fittings

Any owner or occupier of premises upon whom notice to provide prescribed fittings has been served by such company makes default in providing the prescribed fittings, such company, if they think fit, may provide such fittings; or

Where in any such district the fittings of any person are out of order, and not as prescribed, such company may by notice in writing require such person, within twenty-four hours after the date of the service of such notice, to cause the same to be repaired, so as to prevent any waste of water; and if any person fail to comply with the terms of such notice such company (if they think fit) may repair the fittings of such person.

The expenses incurred by such company in providing such fittings or in making such repairs shall be paid to them by the person liable to pay the rate for the water supplied or on whose credit the water is supplied by means of such fittings, or by the owner of the premises.

All such expenses may be recovered, with costs, from the owner, and to the extent of any rent due by the occupier of the premises from such occupier, by proceedings in a court of summary jurisdiction, or by action in any court having jurisdiction locally in the matter, as if the same were an ordinary simple contract debt; and any sum and costs so recovered from an occupier may be deducted by him from the rent payable by him to the owner, and shall be allowed by the owner and every other person interested in the rent, as if the same had been actually paid as rent; but if in any case an occupier fails to disclose the amount of rent due by him, or the name or address of the owner, he shall be liable to pay

the whole amount of such expenses and costs : provided, that as between any such owner and occupier nothing herein contained shall be taken to affect any contract made between them respecting the payment of the expenses of any such works as aforesaid.

30. Where in any district any company is required or has proposed to provide a constant supply, the officers or agents of such company, or of the party requiring such supply, or any person appointed for such purpose by the Board of Trade, may, at all reasonable times, enter any premises within such district in order to inspect the premises for the purposes of this Act, and examine the same with a view to ascertain whether there are in or about the same the prescribed fittings, or, where authorised under the provisions of this Act, to provide or repair the fittings ; and if any person hinder any such officer, agent, or person from entering and making such inspection or examination, or providing or repairing such fittings, every person so offending shall for every such offence be liable to a penalty not exceeding five pounds.

Power to enter premises for inspection and repair of fittings

31. In the event of any dispute as to whether the fittings of any person are as prescribed, such dispute shall be settled by the court of summary jurisdiction, on the application of either party, which court may make such order as to the amount of the costs of the proceedings before such court as seems just, and the decision of such court shall be final and binding on all parties.

Settlement of disputes as to sufficiency, &c. of fittings

32. Where in any district any company is required or has proposed to provide a constant supply,—

If any person supplied with water by such company wilfully or negligently causes or suffers any fittings to be out of repair, or to be so used or contrived as that the water supplied to him by such company is or is likely to be wasted, misused, unduly consumed, or contaminated,

Penalties for non-compliance with the provisions of Act.

or so as to occasion or allow the return of foul air or other noisome or impure matter into any pipe belonging to or connected with the pipes of such company, he shall for every such offence be liable to a penalty not exceeding five pounds ; or

If any person supplied with water by such company wrongfully does or causes or permits to be done anything in contravention of any of the provisions of the special Act or this Act, or wrongfully fails to do anything which, under any of those provisions, ought to be done for the prevention of the waste, misuse, undue consumption or contamination of the water of such company, they may (without prejudice to any remedy against him in respect thereof) cut off any of the pipes by or through which water is supplied by them to him or for his use, and may cease to supply him with water so long as the cause of injury remains or is not remedied ; and in every case of so cutting off or ceasing to supply, the company shall within twenty-four hours thereafter give to the nuisance authority, as defined by the Sanitary Act, 1866, notice thereof.

Absence of
proper water
fittings in
premises to
be a
nuisance.

33. The absence in respect of any premises of the prescribed fittings after the prescribed time shall be a nuisance, within section 11 and sections 12-19 (inclusive) of the Nuisances Removal Act for England, 1855, and within all provisions of the same or any other Act, applying, amending, or otherwise relating to those sections ; and that nuisance, if in any case proved to exist, shall be presumed to be such as to render the premises unfit for human habitation within section 13 of the Nuisances Removal Act for England, 1855, unless and until the contrary is shown to the satisfaction of the justices acting under that section.

Provision
respecting
fire-plugs

34. Section 32 of the Metropolitan Fire Brigade Act, 1865, shall operate, subject and according to the provisions following (that is to say),—

- (1) In that section and in this provision the term ' fire-plug ' and the term ' plug ' shall include hydrant and all other apparatus necessary or proper in connection with the company's pipes for supply of water in case of fire ;
- (2) Where a company give a constant supply in any part of their water limits they may, if they think fit, give notice thereof to the Metropolitan Board of Works :
- (3) If the Metropolitan Board of Works do not within two months after receipt of any such notice specify, as regards that part of the company's water limits, what plugs for supply of water in case of fire, at what places, of what dimensions, and in what form they require the company to provide, then at any time after the expiration of that time the company may, if they think fit, provide in and for that part of their water limits such plugs for supply of water in case of fire, at such places, of such dimensions, and in such form as to the company seem necessary or proper :
- (4) Thereupon, as regards that part of the company's water limits, the company shall be deemed to have fully discharged all obligations imposed on them by the said section 32 :
- (5) All plugs provided by a company in pursuance of this provision may, for the purposes of the fire brigade, be used as if they had been provided on the requisition of the Metropolitan Board of Works, under the said section 32 :
- (6) The providing of plugs by a company under this provision shall be at the expense of the Metropolitan Board of Works, and the costs, charges, and expenses of the Company in or about the providing of the same shall be paid to the

company by the Metropolitan Board of Works, on demand, out of their general rate, and in default may be sued for and recovered, with costs, by the company in any court of competent jurisdiction for the recovery of any ordinary simple contract debt of the like amount.

Quality of Water

Power to board to appoint persons to inquire and report as to quality of water

35. The Board of Trade may at any time, if and when they think fit, appoint a competent person to inquire into and report on the quality of the water furnished by any company, notwithstanding that no complaint has been made and signed by twenty inhabitant householders, as prescribed by section 9 of the Metropolis Water Act, 1852; and sections 10 and 11 and 13, and the other provisions of that Act, shall apply in every respect as if such person were appointed under section 9 of that Act, and as if any matter reported to the Board of Trade as requiring alteration on the part of a company had been the subject of a complaint by such householders as aforesaid.

Appointment and duties of water examiner

36. There shall be a water examiner, being a competent and impartial person, from time to time appointed by and removable by the Board of Trade, who shall from time to time, in such manner as the Board of Trade direct, examine the water supplied by any company, in order to ascertain whether or not the company have complied with the requirements of section 4 of the Metropolis Water Act, 1852, and shall from time to time report the results of his several examinations to the Board of Trade; and the Board of Trade shall send a copy of every such report to the company to which the same relates, and the company may, if they think fit, on each occasion of such examination, be represented thereat by some officer, but such officer shall not interfere in the examination.

There shall be paid to such water examiner such remuneration by the companies and in such proportions as such board appoints.

Accounts

37. Every company shall, on or before the thirty-first day of July in each year, fill up and forward to the Board of Trade, and to the town clerk of the city of London, and to the Metropolitan Board of Works, and to the vestry clerk of each parish within which water is supplied by each company respectively not within the city of London, a statement of account, made up to the end of their financial year then last passed, in such form and containing such particulars as may from time to time be prescribed by the Board of Trade.

Accounts,
&c.

Each company shall keep copies of such statement at their office for one year after the date thereof, and sell the same to any applicant at a price not exceeding one shilling for each such copy.

In case any company make default in complying with any of the provisions of this section, they shall be liable to a penalty not exceeding ten pounds for each day during which such default continues.

38. There shall be an auditor of the accounts of the companies, being a competent and impartial person, from time to time appointed by and removable by the Board of Trade.

Auditor of
accounts

There shall be paid to such auditor such remuneration by the companies and in such proportions as such board appoints.

39. The auditor shall, with all practicable speed after the passing of this Act, investigate the accounts of the companies, and ascertain and certify the amounts of their capitals, distinguishing share from loan capital, and shall ascertain and certify the capital of each company, and shall from time to time, as new capital shall be expended,

Ascertain-
ment of
capital of
companies

in like manner ascertain and certify the amount of such new capital that has been *bonâ fide* expended for the purposes of the undertaking. Notwithstanding anything in this Act, the auditor shall not investigate the accounts of any company antecedent to the date mentioned in that behalf in relation to such company in the Schedule C. to this Act annexed.

Periodical
audit of
accounts

40. The auditor shall once in every half year audit the accounts of the companies.

If he finds the accounts correct he shall certify the same, but if in any instance he finds the accounts of any company incorrect in principle or in detail, he shall require such company to correct such accounts in such manner as he thinks right, and no future dividend shall in any case be declared by any company until their accounts are certified by the auditor; provided that the suspension of a dividend under this section shall not operate until after the expiration of nine months from the date of the audit.

Facilities for
auditor

41. Each company shall, during as well as subsequent to the close of that half year to which the accounts relate, give to the auditor, his clerks and assistants access to the books and documents of such company, and shall, when required, furnish to him and them all vouchers and information requisite for the purposes of the audit, and shall afford to him and them all facilities for the proper execution of his and their duty; and any company making default in complying with any of the provisions of this section shall, for every such default, be liable to a penalty not exceeding ten pounds.

Arbitration
between
auditor and
company

42. If any company think themselves aggrieved by any act or determination of the auditor, the matter in difference shall be referred to the determination of an arbitrator agreed on between such company and the auditor, or, in default of agreement, appointed, on the application of either party, by the Lord Chief Justice of

the Court of Common Pleas ; and the reference shall be subject and according to the provisions of the Common Law Procedure Act, 1854, and the decision of the arbitrator shall be final and conclusive ; and, subject to this provision, such company shall observe and abide by the directions and determinations of the auditor.

Arbitration

43. Where any dispute arises between any persons whatsoever in relation to the execution of this Act, or to any Act, matter, or thing incident to or consequent upon the execution of the same, and where the method of determining any such question in dispute is not expressly provided for, such question may, if the parties so desire, be settled by arbitration in manner prescribed by the Companies Clauses Consolidation Act, 1845, with respect to the settlement of disputes by arbitration.

Disputes
may be
settled by
arbitration

Penalties

44. Every penalty incurred by any company by reason of non-compliance with any of the provisions of this Act shall go and belong to the metropolitan authority within the jurisdiction of which the same has been incurred, and may be sued for and recovered by such metropolitan authority in any court of competent jurisdiction for the recovery of any ordinary simple contract debt of the like amount, and shall be paid and applied as such metropolitan authority shall from time to time direct.

Recovery
and applica-
tion of
penalties

Every such penalty shall be borne and paid (to the satisfaction of the auditor appointed as in this Act provided) exclusively by and out of the divisible profits of the company by whom the penalty is incurred, and by way of reduction of dividend.

45. Except as is by the next preceding section expressly provided, all penalties under this Act may be sued for and recovered in the ' Court of Summary Jurisdiction.'

Summary
proceedings
for penalties,
&c.

Miscellaneous

Form and
service, &c.
of instru-
ments

46. Any instrument (including a notice, order, resolution, declaration, requisition, consent, approval, disapproval, or other document) made, given, delivered, or served under this Act, or any regulation thereunder, may be either in print or in writing (including lithograph), or partly in print and partly in writing (including lithograph), and, if the instrument of a company shall be sufficiently authenticated, by the name of their secretary being affixed thereto in print or writing, or by a stamp on behalf of the company; and it shall be sufficient in all cases where any such instrument is required to be given to or served on the owner or occupier of any premises to address it to such owner or occupier by his description as owner or occupier (as the case may be) of the premises (naming them) in respect of which it is given or served, without further name or description; and any such instrument may be addressed to owners or occupiers of any number of contiguous or neighbouring premises collectively, and when so addressed may be served on more owners and occupiers than one (so that separate copies be served on the respective owners and occupiers of the several premises concerned; and any such instrument may be served on any owner, occupier, or other person either personally or by sending the same through the post in a letter addressed to him by name at his last known place of abode or business, or by delivering the same to some inmate at his last known or usual place of abode or business, or, in case of an occupier, to any inmate of the premises in respect of which it is given or served, or if the premises are unoccupied, and the place of abode of the person to be served is, after diligent inquiry, unknown, it shall be sufficient to affix it, or a copy thereof, on some conspicuous part of such premises.

47. Nothing in this Act shall be deemed to apply to

any of the landed estate, houses, or property of the New River Company not directly used for or connected with their water supply, or to authorise or empower the auditor to investigate or audit any accounts of the New River Company other than those relating to their water supply.

Act not to apply to certain property and accounts of the New River Company

48. In case any consumer leave the premises where water was supplied to him without paying to the company the rate due from him, the company shall not require from the next tenant of the premises payment of the arrears so left unpaid, unless the incoming tenant agreed with the defaulting consumer to pay the arrears, but the company shall, notwithstanding any such arrears, supply water to the incoming tenant, on being required by him so to do.

Incoming tenant not to pay arrears of outgoing tenant, unless by express agreement

49. Sections 17 and 18 of the Metropolis Water Act, 1852, shall be read as if instead of the words 'district mains' and 'district main' in the said sections the words 'pipes' and 'pipe' were substituted respectively; and every company shall, upon the map, and upon every alteration of the same made in conformity with the provisions of the said section 17, as amended by this section, cause to be marked every screw-cock or apparatus by means of which water is permitted to flow or is prevented from flowing from the main into any pipe within the water limits of such company.

Amendment of sections 17 and 18 of Metropolis Water Act, 1852

50. Except as in this Act provided, nothing in this Act shall take away, abridge, or prejudicially affect any right or power which a company would have had under their special Act or the Metropolis Water Act, 1852, or under any charter or otherwise, if this Act had not been passed.

Saving for ordinary powers

Costs

51. All costs, charges, and expenses of or incidental to the preparing, applying for, and passing of this Act,

Expenses of Act

and of promoting the Bill for the like purposes introduced previous to the same, shall be paid by the Mayor, Aldermen and commons of the City of London, and the Metropolitan Board of Works, in such proportions and as and to whom the Board of Trade shall direct.

SCHEDULE A

Places	Description of Metropolitan authority
The City of London and the liberties thereof	The Mayor, Aldermen and Commons of the City of London
The metropolis, except the City of London and the liberties thereof	The Metropolitan Board of Works
Any place within the limits of this Act not included in the above descriptions, and under the jurisdiction of commissioners, trustees, or other persons intrusted by any Local Act with powers of improving, cleansing, or paving such place	The Commissioners, trustees, or other persons intrusted by the Local Act with powers of improving, cleansing, or paving
Any place within the limits of this Act not included in the above descriptions, and within the jurisdiction of local boards constituted in pursuance of the Public Health Act, 1848, and the Local Government Act, 1858, or one of such Acts	The local board
Any place or parish within the limits of this Act not within the above descriptions, and in which a rate is levied for the maintenance of the poor	The vestry, select vestry, or other body of persons acting by virtue of any Act of Parliament, prescription, custom, or otherwise, as or instead of a vestry or select vestry

SCHEDULE B

Parts of the Metropolis Water Act, 1852, which are referred to in section 5 of the foregoing Act, viz. :—

Section 15, except so much thereof as prescribes the height at which the Kent Waterworks Company and the East London Waterworks Company are respectively required to give their supply, sections 19 to 22, both inclusive, and section 27.

SCHEDULE C

Setting forth in relation to each Company the date antecedent to which the accounts of such Company shall not be investigated

Name	Date
The Governor and Company of the New River brought from Chadwell and Amwell to London, commonly called the New River Company	16th day of July, 1866
The Company of Proprietors of the East London Waterworks	15th day of July, 1867
The Southwark and Vauxhall Water Company	12th day of April, 1867
The West Middlesex Waterworks Company	13th day of May, 1869
The Lambeth Waterworks Company	13th day of May, 1869
The Governor and Company of Chelsea Waterworks	3rd day of June, 1864
The Grand Junction Waterworks Company	29th day of May, 1868
The Company of Proprietors of the Kent Waterworks	30th day of June, 1864

WATERWORKS CLAUSES ACT, 1847

*Supply of
Water*

—

A constant
supply of
water to be
kept for
domestic
purposes at
high pres-
sure

And with respect to the supply of water to be furnished by the undertakers, be it enacted as follows :

XXXV. The undertakers shall provide and keep in the pipes to be laid down by them a supply of pure and wholesome water, sufficient for the domestic use of all the inhabitants of the town or district within the limits of the special Act, who, as hereinafter provided, shall be entitled to demand a supply, and shall be willing to pay water rate for the same ; and such supply shall be constantly laid on at such a pressure as will make the water reach the top storey of the highest houses within the said limits, unless it be provided by the special Act that the water to be supplied by the undertakers need not be constantly laid on under pressure ; and the undertakers shall cause pipes to be laid down and water to be brought to every part of the town or district within the limits of the special Act whereunto they shall be required by so many owners or occupiers of houses in that part of the town or district, as that the aggregate amount of water rate payable by them annually at the rates specified in the special Act shall be not less than one-tenth part of the expenses of providing and laying down such pipes : provided that no such requisition shall be binding on the undertakers unless such owners or occupiers shall severally execute an agreement binding themselves to take such supply of water for three successive years at least.

Penalty for
neglect to
lay pipes for
supply of
water for
domestic
use

XXXVI. If for twenty-eight days after demand in writing made to the undertakers, and tender made of an agreement, signed by such number of owners or occupiers

as aforesaid, to take and pay for a supply of water for three years or more, the undertakers shall refuse or neglect to lay down pipes in the manner hereinbefore directed, and to provide such supply of water as aforesaid or as provided by the special Act, they shall forfeit to each of such owners and occupiers the amount of rate which he would be liable to pay under such agreement, and also the further sum of forty shillings for every day during which they shall refuse or neglect to lay down such pipes, or to provide such supply of water: *Provided always, that the undertakers shall not be liable to any penalty for not supplying water if the want of such supply shall arise from frost, unusual drought, or other unavoidable cause or accident.* Proviso

XXXVII. In all the pipes to which any fire-plug shall be fixed the undertakers shall provide and keep constantly laid on, unless prevented by frost, unusual drought, or other unavoidable accident, or during necessary repairs, a sufficient supply of water for the following purposes (that is to say), for cleansing the sewers and drains, for cleansing and watering the streets, and for supplying any public pumps, baths, or wash-houses that may be established for the free use of the inhabitants, or paid for out of any poor rates or borough rates levied within the limits of the special Act; and such supply shall be provided at such rates, in such quantities, and upon such terms and conditions as may be agreed upon by the town commissioners and the undertakers, or, in case of disagreement, as shall be settled in *England* or *Ireland* by two justices, and in *Scotland* by the sheriff, until in either case an inspector shall have been appointed, and after the appointment of such inspector, by the inspector so appointed: Supply of water to be kept for cleansing sewers, drains, &c. and for other public purposes

And with respect to the payment and recovery of the water rates, be it enacted as follows: Water rates

LXVIII. The water rates, except as hereinafter and in the special Act mentioned, shall be paid by and be re- Rates to be payable according to

the annual
value of the
premises

coverable from the person requiring, receiving, or using the supply of water, and shall be payable according to the annual value of the tenement supplied with water, and if any dispute arise as to such value the same shall be determined by two justices.

Where
several
houses sup-
plied by one
pipe, each
to pay

LXIX. When several houses or parts of houses in the separate occupation of several persons are supplied by one common pipe, the several owners or occupiers of such houses or parts of houses shall be liable to the payment of the same rates for the supply of water as they would have been liable to if each of such several houses or parts of houses had been supplied with water from the works of the undertakers by a separate pipe.

Rates to be
paid quar-
terly

LXX. The rates shall be paid in advance by equal quarterly payments, in *England or Ireland*, at *Christmas Day, Lady Day, Midsummer Day, and Michaelmas Day*, and in *Scotland* at *Martinmas, Candlemas, Whitsuntide, and Lammas*, and the first payment shall be made at the time when the pipe by which the water is supplied is made to communicate with the pipes of the undertakers, or at the time when the agreement to take water from the undertakers is made.

Parties
giving notice
to discon-
tinue use of
water, or
removing, to
pay to the
next quarter
day

LXXI. The occupier of any dwelling-house or part of a dwelling-house liable to the payment of any water rate, who shall give notice of his intention to discontinue the use of the water supplied by the undertakers, or who shall remove from his dwelling between any two quarterly days of payment, shall pay the water rate in respect of such dwelling-house or part of a dwelling-house for the quarter ending on the quarterly day of payment next after his quitting the same or giving such notice.

Owners of
houses not
exceeding
10l. rent to
be liable to
water rates

LXXII. The owners of all dwelling-houses or parts of dwelling-houses occupied as separate tenements, the annual value of which houses or tenements shall not exceed the sum of ten pounds, shall be liable to the pay-

ment of the rates instead of the occupiers thereof; and the powers and provisions herein or in the special Act contained for the recovery of rates from occupiers shall be construed to apply to the owners of such houses and tenements; and the persons receiving the rents of any such house or tenement as aforesaid from the occupier thereof, on his own account, or as agent or receiver for any person interested therein, shall be deemed the owner of such house or tenement.

LXXIII. Provided always, that when any owner shall pay any such rate in respect of any such dwelling-house or part of a dwelling-house which shall be in the occupation of any tenant under any lease or agreement made prior to the passing of the special Act, such tenant shall repay to the owner all sums which shall be so by him paid during the continuance of such lease, unless it have been agreed that the owner shall pay the water rates in respect of such dwelling-house or part of a dwelling-house; and every such sum of money payable by the tenant to the owner, under the provision hereinbefore contained, may be recovered, if the same be not paid upon demand, as arrears of rent could be recovered from the occupier by the said owner.

Tenants
under exist-
ing leases to
repay the
owner

LXXIV. If any person supplied with water by the undertakers, or liable as herein or in the special Act provided to pay the water rate, neglect to pay such water rate at any of the said times of payment thereof, the undertakers may stop the water from flowing into the premises in respect of which such rate is payable, by cutting off the pipe to such premises, or by such means as the undertakers shall think fit, and may recover the rate due from such person, if less than twenty pounds, with the expenses of cutting off the water, and costs of recovering the rate, in the same manner as any damages for the recovery of which no special provision is made are

Rates how
to be re-
covered

recoverable by this or the special Act ; or if the rate so due amount to twenty pounds or upwards, the undertakers may recover the same, with the expenses of cutting off the water, by action in any court of competent jurisdiction.

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